Report on potential impacts of climatic change on regional development and infrastructure. RESPONSES project deliverable D6.3

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Report on potential impacts of climatic change on regional development and infrastructure

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Abstract

Over the coming decades, the European continent is expected to be confronted with major impacts due to climate change, with an increase in the frequency of extreme events. Across the different European regions, impacts and vulnerability will vary in intensity and effect, according to changes in exposure to specific climatic stimuli and changes of non-climatic factors. To better prioritise adaptation strategies, there is a need for quantitative pan-European regional level assessments that are systematic and comparable across multiple hydro-meteorological hazards. This study presents an indicator-based impact assessment framework at NUTS-2 level that quantifies potential regional changes related to four weather hazards (heat stress, river flood risk, drought proneness, and forest fire danger) by comparing the current situation with two scenario periods (2011-2040 and 2041-2070). For each hazard individually, the methodology integrates outcomes of a set of coherent high-resolution regional climate models, based on the SRES A1B high emission scenario, with current and projected non-climatic parameters, in order to quantify climate change impact. An index of regional adaptive capacity is developed and, in addition, financial allocations on climate adaptation within the EU Structural Funds are contrasted with the resulting impact indicators to identify hotspot regions of high vulnerability. The results project strongest increases for heat stress followed by forest fire danger, while for drought proneness and flood risk the sign and magnitude of change vary across regions. An overall assessment combining all four hazards shows a clear trend towards increasing impact from climate-related natural hazards for most parts of Europe in the coming decades. Most hotspot regions are projected to be found in eastern and southern Europe, which currently also have the lowest adaptive capacities. This spatially explicit portfolio of comparable hazard assessments provides a valuable basis for discussions in the context of climate adaptation mainstreaming at EU and regional level.

1. Introduction

1.1. Background

The EU budget for regional development comprises a large share of the total funding that the EU has available. Approximately 347 billion Euros are being invested in the 2007-2013 period under the EU Structural Funds. It has been acknowledged since early stages that projects supported by the fund, often in the form of infrastructure investments, are at risk from natural disasters, and possibly from climate change, and that paying proper attention to these risks is required (e.g. Burton and Van Aalst, 1999; Bouwer and Aerts, 2006; von Breska, 2010; Mitchell et al., 2010; World Bank and UN, 2010). The case for good options for synergies between disaster prevention and adaptation to a changing climate has been made several times (Thomalla et al., 2006; Bouwer and Aerts, 2006). In Europe, the main natural hazards that lead to large scale losses to buildings, infrastructure, and economic activities are windstorms and floods. An analysis over the 30-year period 1980-2009 shows that windstorms in Europe caused some 132 billion Euros in losses or 32% of total losses, and flooding accounts for about 104 billion Euros or 25% of total losses from natural disasters (EEA, 2010). In terms of fatalities, heat waves are the most deadly natural disaster, causing about 73,400 casualties over the same period, which is 68% of all fatal casualties associated with natural disasters in Europe (EEA, 2010).

Climate change has already caused changes in some types of extreme weather, notably high temperatures, droughts, and extreme rainfall (IPCC, 2007a; EEA-JRC-WHO, 2008; IPCC, 2011). In the future these extremes are likely to increase in frequency. For windstorms there is much more uncertainty about the direction of change for Europe (IPCC, 2007a; EEA-JRC-WHO, 2008). It is important to note that apart from climate changes, economic losses have been rising in recent decades mostly due to increasing habitation of vulnerable areas, and increasing value of assets at risk (Bouwer et al., 2007; Barredo, 2010; Bouwer, 2011). Also, natural climatic variations can lead to large variations in impacts over time. For instance, the late 1980s and early 1990s have witnessed severe windstorm impacts in Europe (Barredo, 2010). Regardless of whether the impacts of natural disasters have already become noticeably worse, projections of future shifts in extreme weather are a concern to decision makers now, and the exploration of strategies is required to consider these possible shifts in decision making.

The European Commission has recognised that action is needed to safeguard Europe from the risks of natural disasters. First, the Commission has identified climate change and related natural disasters as a threat to its economic development policies (DG Regio, 2008; von Breska, 2010), and it has identified southern Europe as being most at risk (DG Regio, 2008). Second, the Communication on a Community approach on the prevention of natural and man-made disasters (COM(2009) 82) states that the effectiveness of Community funding for disaster prevention needs to be improved. Regarding increasing risks posed by climate change, the White Paper on adaptation to climate change (COM(2009) 147) recognises that the EU and Member States need to "(e)stimate adaptation costs for relevant policy areas so that they can be taken into account in future financial decisions". Given the importance of the Structural Funds in financing economic development across the EU, it is very relevant to study potential impacts of weather hazards on these investments. Moreover, in this context there is a need to study approaches that encourage a process of financial decisions that take into account risks from natural hazards and climate change, and that lead to a reduction of potential impacts.

Within the FP7 RESPONSES research project, the infrastructure and regional development investments of the European Union have been identified as an area where comprehensive studies are required into the exposure and potential impacts, as well as into the ways in which investment decision processes can be transformed (Hanger et al., 2011, RESPONSES Deliberable D6.1). One of the aims of the work package on this topic is to assess the impacts of climate change (Task 6.3). There is a sizeable amount of literature available on assessing impacts from EU investments on unsustainable practices, such as soil, water and air pollution, including greenhouse gas emissions (e.g. European Parliament, 2011). However, so far, relatively few studies have looked into the links between regional investments, and risks from climate change. European finance institutions have recognised the need to study the risks from natural hazards to their investment portfolio's, for instance from flooding (EIB, 2007). In this context, approaches also exist that take into account future climate change, and these have been applied in a number of cases (e.g. Klein et al., 2007). However, few studies have attempted to arrive at approaches that combine the classical climate change impact assessment with information on development investments.

For assessing the risk from climate change, climate impact and vulnerability assessments have often been carried out for various specific impacts, including extreme weather events such as floods, drought, and storms. Some studies have taken a 'bottom-up' approach, assessing the vulnerability of people and physical systems, while others have taken a 'top-down' impact assessment approach involving downscaling of climate projections and quantification of subsequent impacts. But many studies consist of a combination of both approaches and a clear line between these two approaches cannot be drawn (Patt et al., 2009). Vulnerability assessments are usually more explicit and precise on adaptation potential (Füssel and Klein 2006).

A number of studies have performed analysis of climate change impacts across Europe, for impacts related to river flood risk, coastal flood risk (sea level rise), and agriculture (e.g. Ciscar et al., 2011; Feyen et al., 2009; Hinkel et al., 2010; Feyen et al., in press). Some other studies have developed more general indicators for climate change vulnerability and impacts. For instance, for ecosystems a vulnerability index was established in the ATEAM project (Metzger and Schröter, 2006). For regional policy, a climate change vulnerability index was established for European regions, as part of the EU Fifth Cohesion Report (von Breska, 2010). The ESPON project has developed an approach for assessing natural and technological risks in Europe, through the aggregation of information on hazard and vulnerability (Greiving, 2006).

1.2. Set-up of the current research

The goal of the current document is to report on the impact assessment that was carried out for selected natural hazard risks under climate change in the EU. Specifically, the objective of the research was to make an analysis of information available for the EU27 on:

1. Quantification of current impacts for infrastructure from weather hazards driven by climate change based on an assessment approach that is comparable and consistent across European countries and hazards.
2. Assessment of potential changes in impacts from weather hazards over the coming 50 to 60 years, including the identification of hotspots of change.
3. Comparison of (changes in) hazard impacts with current investments (2007-2013) through the Structural Funds of the European Union.

The approach taken here to assess changes in risks from extreme weather events on infrastructure driven by climate change is based upon indicators rather than detailed risk models. The assumption is made that the main threat of anthropogenic climate change lies in the shift of extreme weather events that would potentially add to increasing disruption of economic activities across the European Union. This in turn could affect infrastructure, activities, and services supported by investments from the EU. Obviously, other impacts from climate change such as ecological impacts (e.g. shifts in biodiversity and species distributions, changes in growing season, etc.), can also lead to economic losses (or benefits) and may therefore be relevant for regional development policy. However, in order to limit the scope of this study, it was chosen to focus on a number of weather hazards with an immediate linkage to risks for human lives and the integrity of physical facilities and economic activities.

For quantifying impacts from changes in extreme weather on EU investments into individual physical infrastructure (e.g. power supply networks, road networks, railway networks, water supply networks), detailed modelling at a fine spatial scale would be required. For the geographical extent of the study, which is the 27 EU Member States territory, this is not feasible due to limitations in the availability of consistent and comparable data that would be required for this modelling. Also, the data that is available on investments through the EU Structural Funds does not allow determining exactly the exposure and sensitivity to these weather events of the related projects that received funding. This information on EU funding was qualitatively described in RESPONSES deliverable D6.1 (Hanger et al., 2011), and further described in a separate deliverable D6.2 (Lung et al., 2011). Case studies limited to a single region or country might be more suited for such assessments. In contrast, the set of indicators developed here allow to identify impacts through:

1. The spatial distribution of shifts in extreme weather events across Europe, according to climate change scenarios, which are assumed to be indicative of actual impacts;
2. Current exposure and sensitivity to these extreme weather types, as well as projected changes in exposure and sensitivity, the latter based on scenarios for socioeconomic change;
3. Identification of hotspot regions in Europe, defined by high climate change impact but receive little funding through allocations of the Structural Funds relevant for adaptation.

In the current study, the following conceptual approach is taken for the impact assessment (Figure 1.1): First, for each individual hazard, a number of parameters is selected to represent the current exposure and sensitivity to climatic stimuli. To represent the exposure, climate indicators such as tropical nights or the number of consecutive dry days are chosen, while sensitivity is typically covered by socio-economic data on population structure or by data on land use patterns. By combining the information on climate exposure and sensitivity, an assessment is made of current impacts. Secondly, by using information on scenarios for future exposure and sensitivity it is possible to assess future changes in impacts. By combining the impact indicators with the estimated adaptive capacity indicator, hotspots can be identified that have low adaptive capacities and high impacts. Finally, with information on actual EU investments, an assessment is made of hotspot areas that also receive little EU funding through the Structural Funds that could potentially be used for adaptation. The unit of analysis is the NUTS 2 geospatial regions.

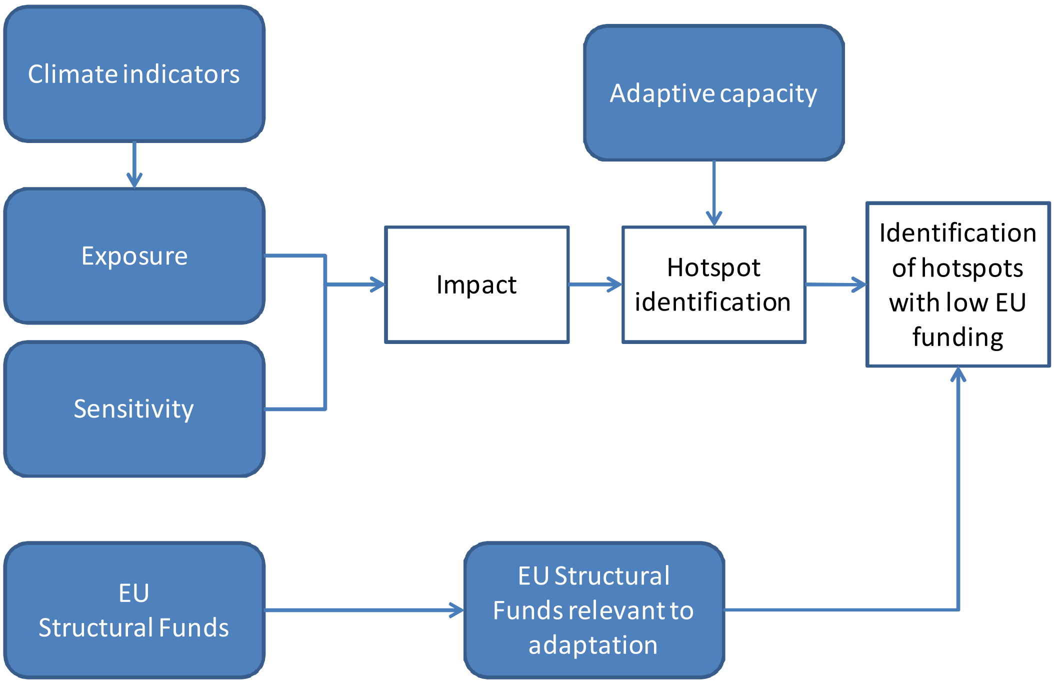

Figure 1.1: Conceptual approach of assessing risk and vulnerability related to regional funding.

1.3. Introduction to this report

In this report, Chapter 2 introduces the climate change impact and vulnerability indicators, and includes an introduction to the EU Structural Funds investments relevant to adaptation. Chapter 3 explains the quantification of differences between European regions in adaptive capacity. Chapter 4 provides the computation of the impact indicators and the identification of vulnerability hotspots, developed for heat stress, river flood risk, drought proneness, and forest fire danger. Chapter 5 explains the aggregation to overall impact and vulnerability hotspots. Chapter 6 discusses the results and concludes.

2. Indicators of climate change impact and vulnerability – a multi-hazard approach

2.1. The general theoretical framework

2.1.1. Definitions and the target system

This study aims at providing spatially explicit, quantitative indicators for climate change impacts related to selected extreme weather events at pan-European regional level. When constructing environmental indicators, a major challenge is to simplify and convey complex realities into a tangible and easily understandable metric that reflects essential relationships and components of a system (Barnett et al., 2008). In particular in relation to climate change, there is an ongoing intense scientific debate on conceptual thinking and definitions underlying vulnerability assessments (e.g. Adger, 2006; Eriksen and Kelly, 2007) and the appropriateness of indicators in this context (Hinkel, 2011). One of the reasons for such "Babylonian confusion" is the interdisciplinary nature of vulnerability research, being a melting pot for different schools of thought. These schools include the disaster risk management community, the political economy community, and the climate impacts community. This study draws upon the definition of vulnerability of the Intergovernmental Panel on Climate Change (IPCC, 2007a) which is as follows: "*Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, the sensitivity and adaptive capacity of that system*."

However, several studies have pointed out that this definition is relatively vague and difficult to operationalise in practise (e.g. Hinkel, 2011). Consequently, several frameworks have been proposed to refine and concretise the IPCC definition (e.g. Turner et al., 2003; Schröter et al., 2005b; Ionescu et al., 2009). Here, we built on the concept of impact and vulnerability assessment by Füssel and Klein (2006), but without considering the mitigation of climate change, through reduction of emissions or increasing sinks of greenhouse gasses (see Figure 2.1). The framework uses the IPCC definition of exposure as "*the nature and degree to which a system is exposed to significant climatic variations*". Furthermore, the authors define that "*the sensitivity of a system denotes the (generally multi-factorial and dynamic) dose – response relationship between its exposure to climatic stimuli and the resulting impacts".* In other words, the impact of climate change on a system is determined by exposure and sensitivity parameters whereby Füssel and Klein (2006) admit that the distinction between the two components is not always straightforward. In any case, impact assessment has to consider non-climatic factors that determine exposure, sensitivity and adaptive capacity (see Figure 2.1), which can be a wide range of environmental, economic, demographic, social, and other factors. To make the concept operational within this study, parameters have been selected that quantify the climatic variations a system is exposed to. A second set of parameters, mostly non-climatic factors such as land use patterns and population structure, has been selected to represent the system's sensitivity to those climatic variations. The two sets of parameters are then combined into indicators to quantify potential impacts of climate change.

However, vulnerability to climate change is not solely driven by potential impacts but has to be assessed taking into account the adaptive capacity of a system (see Figure 2.1). According to the IPCC (2007a), adaptive capacity is "*the ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behaviour and in resources and technologies*". Vulnerability and adaptive capacity are negatively correlated (Füssel & Klein, 2006). In other words, adaptation is the adjustment of a system in reaction to climate (or generally environmental threats) in order to reduce harm or to generate new opportunities. Like vulnerability, the concept of adaptive capacity is subject to a methodological debate, and several review studies have attempted to combine insights from different research traditions (e.g. Smit and Wandel, 2006; Engle, 2011). An important distinction made by the IPCC (2007b) is between autonomous or spontaneous adaptation on the on hand and planned adaptation on the other hand. Autonomous adaptation relates to the people's individual perception and understanding of climate change and some authors argue that it strongly determines the true adaptive capacity of a system (Bazerman, 2006). However, as autonomous adaptive capacity is difficult to measure or quantify (if not impossible), we here focus on assessing a system's potential to implement planned adaptation measures.

By combining indicators on impact with those on adaptive capacity we aim at measuring the vulnerability of a system (Figure 2.1).

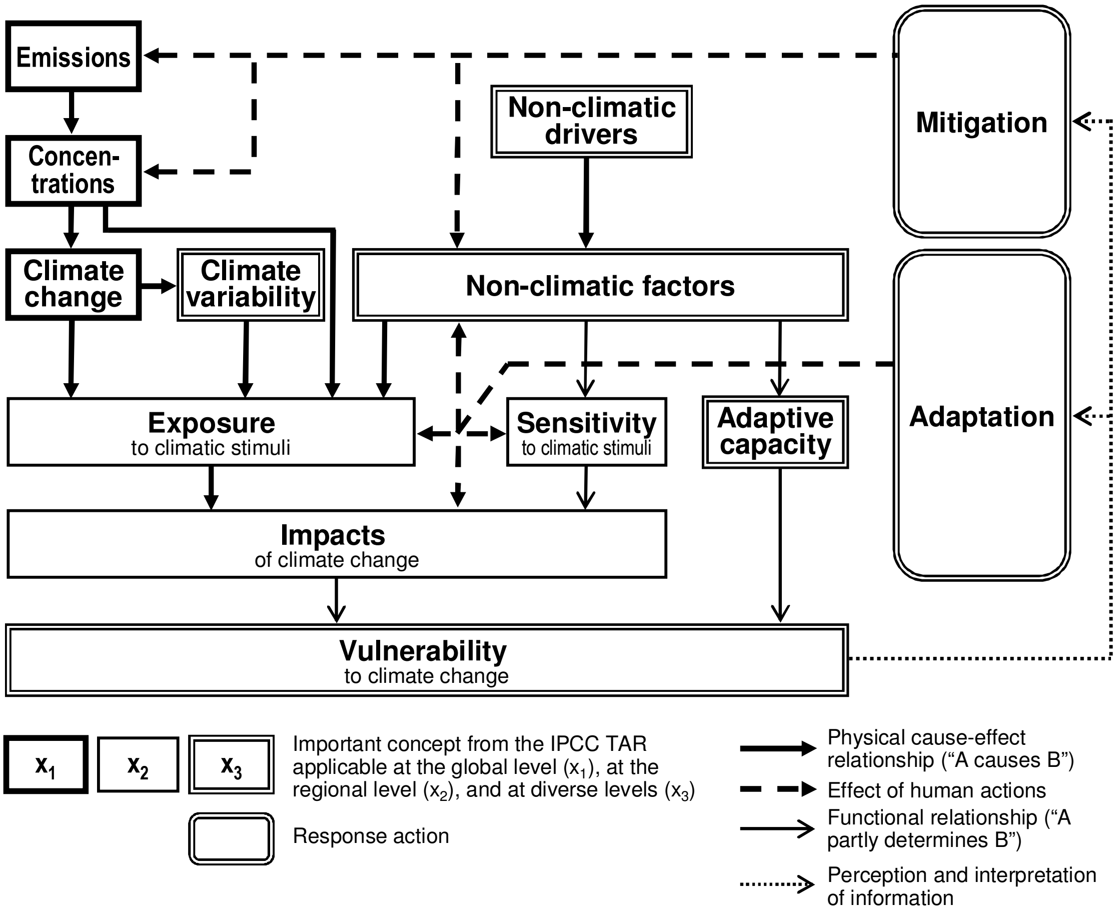

Figure 2.1: Conceptual framework of vulnerability assessment by Füssel and Klein (2006) (their "second generation vulnerability assessment").

Apart from the general framework for vulnerability assessment, the different dimensions of a vulnerable system should be precisely defined to avoid methodological and terminological confusion. According to Füssel (2007) four main components can be distinguished:

- the targeted system;
- the attribute of concern;
- the hazard (i.e. potentially damaging physical event, also called stressors (Turner et al, 2003));
- the temporal reference.

The objects of the analysis of this work are geographical regions, more specifically the 271 NUTS-2 regions of the 27 EU Member States (EU27). NUTS2 regions usually correspond with individual provinces or other administrative units within each EU Member State country. Within each NUTS-2 region, the target systems are humans and economic activities. These systems are assumed to be relatively homogenous within each geographical unit (i.e. each NUTS-2 region), and the data available is assumed be representative of the characteristics of these systems. The valued attribute of the systems is defined as human lives and health as well as the integrity of physical facilities (infrastructure) and economic functions that support human well-being. The valued attribute depends on certain climatic conditions. In total, four hydro-meteorological hazards that could potentially have a damaging influence on the systems (NUTS-2 region) are taken into account (see section 2.1.2 for details). Finally, the time horizon of the assessment is divided into three explicit time slices: the current situation (hereafter referred to as baseline period and in terms of exposure to climatic stimuli defined as the period between the years 1961 and 1990, a short-term scenario period from 2011 to 2040 and a longer-term scenario period 2041 to 2070. While climate data have been available for all three time slices (see section 2.1.3 for details), the various data used as proxies for a region's sensitivity to climatic stimuli have been matched to the three time periods to the extent possible (for details see the hazard-specific sections of Chapter 4).

Moreover, this analysis is not providing a strict economic assessment in terms of a monetary evaluation of e.g. damage costs or adaptation costs. Instead, we aim at providing dimensionless quantitative indicators of climate impact and vulnerability derived from physical, economic and social factors. This allows for hazard-specific comparisons between European regions in terms of current and potential future risks due to climate change.

2.1.2. Hazards

According to United Nations (2004), a hazard is "*a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation*". Hazards can be broadly typified into three groups: (1) hydrometeorological or weather-related hazards (e.g. floods, droughts, and extreme temperature events), (2) geophysical hazards such as landslides, earthquakes or snow avalanches, and (3) technological hazards (e.g. oil spills, industrial accidents) (EEA, 2010). This work focuses on hydrometeorological hazards, i.e. the group with a potentially immediate linkage to climate change. Within this category we selected the following four hazards: (1) Heat/extreme temperature events, (2) River floods, (3) Droughts/water scarcity, and (4) Forest fires (see Figure 2.2). These four hazards were selected on the basis of the following criteria:

- Severe economic and social impacts in Europe, evident from historic events (EEA, 2010). Heat stress has led to the largest number of casualties in Europe over the past decade (see Section 1.1). Regarding river floods, several disasters have recently led widespread losses in several places throughout Europe, e.g. in 2002 in central Europe or in 2007 in the UK. Forest fires and droughts are main weather hazards in southern Europe, with drought leading to substantial impacts on agriculture and urban water supplies. Forest fires have lead to substantial damages to property in Greece, Spain and Portugal.
- A great likelihood to be affected by anthropogenic climate change, as indicated by outcomes from previous assessments (e.g. IPCC, 2007a; EEA-JRC-WHO, 2008).
- Sufficient data availability in terms of both exposure and sensitivity to climatic stimuli. This information comes from previous European research projects, as well as from databases held by the JRC.

The following nomenclature has been defined for parameters with respect to the four hazards and is used throughout this document: first letter: **H** = heat, **F** = floods, **D** = droughts, **FF** = forest fires; second letter: **E** = exposure, **S** = sensitivity, **AC** = adaptive capacity; an underscore is positioned after the first two letters followed by the identification code of the indicator itself, for example 'HE_HDWI' denotes the heat stress exposure parameter 'heat wave duration index' (HDWI).

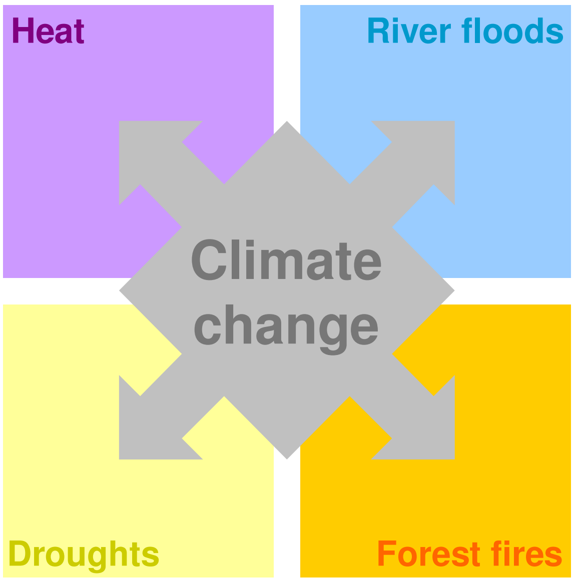

Figure 2.2: The four dimensions of climate-related hazards considered in this study.

Depending on the choice of input parameters, each of the four hazards could potentially be assessed from different perspectives. Therefore, we here explain more precisely what exactly is or is not addressed, linking back to the study's definition of the targeted system and the valued attributes (see previous section). Both heat/extreme temperature events and river floods are analysed in terms of effects on and risks for human lives/health and physical infrastructure whereas potential ecological consequences / changes of ecosystems or biodiversity (e.g. Metzger et al., 2006; Araújo et al., 2006) are not considered. Flood assessment focuses on floods from rivers, since coastal vulnerability, including risks from storm surge floods and sea level rise, has been recently analysed in a comprehensive and consistent manner by the DINAS-COAST project (Klein and Hinkel, 2009). Droughts can generally be grouped into four types with increasing complexity, meteorological droughts, hydrological droughts, agricultural droughts, and socio-economic droughts (EEA-JRC-WHO, 2008). This work aims to address impacts and vulnerability related to agricultural droughts in a broader sense without narrowing the analysis down to specific aspects such as crop yield and productivity (Ewert et al., 2005), livestock production (Holden and Brereton, 2003), or the proliferation of insect pests (Baker et al., 2000). Furthermore, the scope of the study is limited to the assessment of climate change impact on rain-fed agriculture, and therefore the reduction of risks through human interventions in the water balance, such as irrigation, is not considered. Regarding forest fires we aim at assessing the general long-term fire potential in terms of fire danger rather than providing an indicator of ecological impact.

Several authors have emphasised the important role of the study design for impact and vulnerability assessments. In this context it has been argued that instead of attempting to develop some kind of general overall quantification of vulnerability for an area or region, stressor or hazard-specific approaches should be followed to increase transparency and credibility (Luers et al., 2003; Eriksen and Kelly, 2007; Tol and Yohe, 2007). Therefore, this study does not aggregate the four hazards during the assessment but calculates impact and vulnerability for each hazard separately in order to identify hazard-specific regional hotspots (Chapter 4). Overall impact and vulnerability is then presented as a supplementary piece of information (Chapter 5).

Another factor fundamentally influencing the outcome of vulnerability assessments is the issue of data availability (Yohe and Tol, 2002; Schröter et al., 2005). This becomes even more crucial when aiming at a pan-European regional assessment as social-economic data are scarce at NUTS-2 or even NUTS-3 level (cp. Greiving, 2006). However, instead of reporting extensive lists of potentially useful but not available input parameters for each hazard indicator, we here focus on analysing and presenting the pan-European information that is available (and known to the authors). In Chapter 5 a section is dedicated to a general discussion of data availability in the light of the results of this study.

2.1.3. Climate data

In order to assess potential impacts of climate change through the emission of greenhouse gasses, climate projections derived from General Circulation Models (GCMs) are considered the most advanced tools (Giorgi, 2005; IPCC, 2007a). However, due to their coarse resolution (typically 100x100 to 300x300km), downscaling methods are needed to ensure an appropriate representation of atmospheric processes for regional analyses, e.g. at the European scale. A widely applied technique is dynamical downscaling by means of limited-area models, usually referred to as Regional Climate Models (RCMs), with boundary conditions derived from GCMs (Fowler et al., 2007). One of the recent achievements for Europe in this regard is a co-ordinated prediction system composed of different RCMs driven by various GCMs produced by a number of European institutions within the FP6 project ENSEMBLES (van der Linden & Mitchell 2009). These RCMs were mostly run for the time period 1961 to 2100, with a horizontal spatial resolution of 25 x 25 or 50 x 50 km and fitted according to the SRES-A1B socio-economic scenario of the IPCC (Nakicenovic and Swart, 2000). The A1B scenario is highly suitable to represent a 4°C (adaptation) world up to around 2060-70. In this work, we do not assess the impacts of a two degree global warming. From the total number of ENSEMBLES experiments nesting RCMs into GCMs, for this work five simulations have been selected to reduce the computational effort (see Table 2.1). The selection was based on the criterion “pick if possible five different RCMs from five different institutions with five different GCM forcings” to ensure that as much as possible of the total variability of all RCM simulations is covered.

Despite the advancements in regional accuracy achieved by dynamic downscaling approaches RCMs still produce systematic biases, either inherited from GCMs or caused by RCM errors or parameterisations (e.g. Suklitsch et al., 2011). At the European scale, models are for instance known to overestimate summer temperature in Southern Europe (Jacob et al., 2007) and daily minimum temperature in Northern Europe (Kjellström et al., 2010) whereas precipitation in Northern Europe is too abundant in winter (Christensen et al., 2008). Therefore, the need for bias-corrections is well known. Teutschbein and Seibert (2010) have even argued not do use GCM-RCM data in climate change impact assessments unless they have been corrected. As a result several techniques to address the problem have been developed of which the statistical bias correction by Piani et al. (2010a, b) is one of the most recent. This approach uses the E-OBS observational dataset (Haylock et al., 2008) and proved to work particularly well for the tails (extremes) of the probability distribution functions of both precipitation and temperature. Recently, it has been successfully applied to correct the ENSEMBLES RCM simulations, greatly improving also the statistics that depend on a temporal sequence such as number of consecutive dry days (Dosio and Paruolo, 2011). Hence, all climate data used for the impact assessments in this study were taken from that work.

For the five selected model runs and for the three 30-year periods, the bias-corrected data were processed to a set of indicators for climate change and extremes. The indicator data are stored as spatial layers with a common grid resolution of 10km and using a standard equal area projection conform to the specifications of Commission Regulation (EU) No 1089/2010 on the interoperability of spatial data sets and services (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:323:0011:0102:EN:PDF). For each of the four hazards considered in this study, different indicators were chosen for the five RCM simulations and the three 30-year time periods (baseline 1961-90, scenario 2011-40, scenario 2041-70) (for details see Chapter 4). Finally, for each indicator a simple mean of the five RCMs was calculated. Predicted changes in mean annual temperature in Europe from to the baseline 1961-90 to 2011-40 range from 0.7 to 1.8 degrees (see Table 2.2). Comparing the baseline 1961-90 with the period 2041-70 shows variations in increases between 1.8 and 3.2 degrees while the five models range from 2.5 to 5.0 degrees for the last three decades of the century (2071-2100).

Table 2.1: Overview on five downscaled regional climate model (RCM) runs at 25 km resolution from the FP6 ENSEMBLES project used for deriving climate exposure parameters.

Simulation name	Institution	RCM (reference)	GCM (reference)
C4I_RCA_HadCM3Q16	C4I	RCA3 (Samuelsson et al., 2011)	HadCM3Q16 (Collins et al., 2010)
CNRM_ALADIN_ARPEGE	CNRM	ALADIN (Radu et al., 2008)	ARPEGE (Gibelin and Déqué, 2003)
DMI_HIRHAM_ECHAM5	DMI	HIRHAM (Christensen et al., 2006)	ECHAM5 (Roeckner et al., 2003)
ETHZ_CLM_HadCM3Q0	ETHZ	CLM (Böhm, 2006)	HadCM3Q0 (Collins et al., 2010)
SMHI_RCA_BCM	SMHI	RCA3 (Samuelsson et al., 2011)	BCM (Furevik et al., 2003)

Table 2.2: Projected increases of mean annual temperature (in ˚C) for European land area (excluding Russia), comparing the baseline 1961-90 with 2011-40, 2041-70, and 2071-2100, for five bias-corrected regional climate models (RCMs) from the ENSEMBLES project, as selected for this study.

	Institution (full simulation name see Table 2.1)					
Time period	C4I	CNRM	DMI	ETHZ	SMHI	ENSEMBLE (=AVERAGE)
1961-90 to 2011-2040	1.8	1.2	0.8	1.5	0.7	1.2
1961-90 to 2041-2070	3.2	2.2	1.8	2.6	1.9	2.3
1961-90 to 2071-2100	5.0	3.1	2.5	3.5	2.7	3.3

2.2. Statistical assessment

Well established methodologies and procedures were followed in order to arrive at a set of indicators, constructed on a sound statistical basis and consistent across the four types of weather hazards considered. The steps outlined in the OECD/JRC handbook on constructing composite indicators (OECD, 2008, see Figure 2.3) were taken a general guideline in this context. Step 1, the development of a theoretical framework, is outlined in Chapter 1 while details regarding step 2, the selection of data for each hazard as well as the adaptive capacity, are given in Chapters 3 and 4, respectively. The following sections focus on methodological choices that are related to steps 3 to 6 as well as step 10 and that are generally valid for all four hazard dimensions. The cases where data-specific methodological adjustments had to be made are explained in the respective hazard-specific chapter and sections.

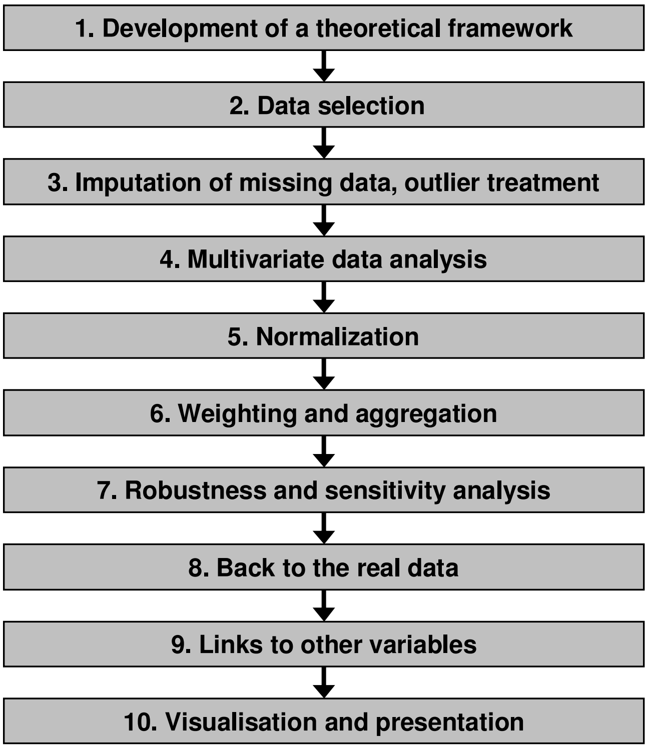

Figure 2.3: Ten-step approach for constructing composite indicators (adopted from OECD, 2008).

2.2.1. Imputation of missing data and outlier treatment

Generally, missing data can be approached in three different ways: (i) case deletion (i.e. discarding missing records), (ii) single imputation such as mean/median substitution or hot-and cold-deck imputation, and (iii) multiple imputation (Little and Rubin, 2002). Ad hoc case deletion was applied only if climate data from the ENSEMBLES runs was not available. This was the case for in total 10 small (island) NUTS-2 regions of Spain, Portugal and Malta, as well as the French oversees departments (see Table 2.3), reducing the number of analysed NUTS-2 regions within the European Union member states from 271 to 261. While for the remaining 261 NUTS-2 regions climate data were complete, instances of missing data related to socio-economic datasets and other data were treated individually (for details see sections 3.1, 4.1.1, 4.2.1, 4.3.1, and 4.4.1), but following some general rules. If possible, missing values for a specific year were replaced with the values from another year. Likewise, if only NUTS-1 data has been available, this data was used to impute missing NUTS-2 values. In case sensitivity parameters have not been available for one or both scenario periods, the data from the last available time period was used for the missing time period(s), i.e. a no-change scenario over time was assumed.

Table 2.3: NUTS-2 regions discarded from analysis due to missing ENSEMBLES climate data for these areas.

Code	Name
ES63	Ciudad Autónoma de Ceuta
ES64	Ciudad Autónoma de Melilla
ES70	Canarias
FR91	Guadeloupe
FR92	Martinique
FR93	Guyane
FR94	Réunion
MT00	Malta
PT20	Região Autónoma dos Açores
PT30	Região Autónoma da Madeira

Outliers are values that appear to stand apart from the rest of the distribution (e.g. Barnett and Lewis, 1994). As they generally “spoil” basic statistics such as the mean or the standard deviation, outliers have to be treated in order to avoid an undue influence on the final indicator(s). This refers to all datasets used in this study, i.e. both the climate data and all other data such as socio-economic data or data on land use. Therefore, a couple of measures were taken to detect potential outliers. A first visual check of all variables was conducted by printing them as scatter plots. Additionally, all values outside the inter-quartile ranges (Tukey, 1977, see formula 1) were initially flagged as problematic, applying the following definition:

Lower boundary: $L = Q1 - 1.5 \cdot (Q3 - Q1)$
Upper boundary: $U = Q3 + 1.5 \cdot (Q3 - Q1)$ (1)

where Q_1 and Q_3 are respectively the first and the third quartile. Moreover, skewness and kurtosis values were calculated for each variable. Skewness values > 1 could flag potentially problematic parameters that need further attention and that possibly need to be transformed before indicators are constructed (Groeneveld and Meeden, 1984). Likewise, kurtosis values > 3.5 might point to the fact that the variance is the result of infrequent, extreme deviations. Considering the high number of 261 regions (256 in case of floods) we applied slightly less strict thresholds of skewness < |2| and kurtosis < 3.75.

In case a single outlier was identified both visually and by the inter-quartiles range method, it was winsorised by resetting it to its neighbouring values (i.e. to the value of the next highest/lowest NUTS-2 region of the 261 regions that was considered to be just within the normal range, see Appendix A for a list of all winsorised NUTS-2 regions for all parameters). If additionally the skewness and kurtosis values were beyond the above defined thresholds, the winsorisation procedure was repeated for multiple values until both skewness and kurtosis dropped below their respective thresholds. In case this would have required the winsorisation of more then 5% of the values of the dataset (i.e. more then 13 values), a Box-Cox data transformation (Zani, 2000) was applied instead of the winsorisation approach. Box-Cox transformations depend on parameter λ and take the form of:

$\Phi_\lambda(x) = x^\lambda - 1 / \lambda$ (if $\lambda \neq 0$) or
$\Phi_\lambda(x) = \log(\lambda)$ (if $\lambda = 0$) (2)

Box-Cox transformations generate a contraction of higher values when $\lambda < 1$ but stretch higher values if $\lambda > 1$. The choice of the value of λ depends on the distribution (i.e. either positive or negative asymmetry). We iteratively adjusted λ for each dataset until the threshold criteria for skewness and kurtosis were met.

2.2.2. Multivariate analysis

Multivariate analysis investigates the underlying structure of the dataset and helps to identify groups of parameters that are statistically similar, as well as it serves as a basis for comparing the fit of the determined data structure with the theoretical framework (OECD, 2008). Among the most commonly used methods in this context are the cluster analysis (CA) as a descriptive tool, as well as principal component analysis (PCA) to analyse how and to what extent the variables are associated with each other. The latter is of particular importance if so-called pillars (and/or sub-pillars) have been defined with the objective of grouping a high number of variables into different dimensions within an indicator (e.g. the Regional Competiveness Index 2010; Annoni and Kozovska, 2010). If each dimension is measured by a large number of highly correlated original values, a PCA often helps to reduce them to a smaller number of transformed variables. PCA is based on the covariance matrix which takes the form of a correlation matrix if the variables are standardised to have zero means and unit variances.

For each climate-related hazard within the framework of this assessment, climate change impact of a region is not captured by a large number of highly inter-related but by a limited number of moderately too weakly correlated parameters that capture distinctive, different aspects of exposure and sensitivity. Consequently the correlation matrices, calculated using the Pearson’s correlation coefficient, mostly show medium to low bivariate correlations (see Chapter 4 for details) and hence, a PCA is not of value. An exception are the parameters used for adaptive capacity, which entail a different correlation structure and which therefore were suitable for employing a PCA (see Section 3.1 for details).

2.2.3. Data normalisation

In order to render variables with different measurement units comparable, normalisation is required. The choice from the variety of existing methods (e.g. Freudenberg, 2003) depends upon the data properties with respect to the original measurement unit and upon the objectives with the indicator (OECD, 2008). In our case, all individual variables are quantitative variables, for which ideally the absolute levels (i.e. relative distances to each other) should be kept. Therefore, applying a ranking procedure or categorical scales would be unsuitable as relative distances would be lost. Furthermore, the normalisation method should adjust for different variances and should be suited for assessing the regions' performance over the three time periods defined. The latter criteria limits the use of the popular Min-Max method, even when applied across time (i.e. taking the Min and Max across time instead of the Min and Max for each period individually) as this transformation is not stable if updated data over time would become available. Consequently, standardisation (z-scores) was chosen as normalisation method, as it meets all the above outlined criteria. It is defined as:

$$I^t_{qr} = \frac{x^t_{qr} - x^t_{qr=\bar{r}}}{\sigma^t_{qr=\bar{r}}} \tag{3}$$

where *I* is the normalised value of individual parameter *q* for NUTS-2 region *r* at time *t.* For each individual parameter x^t_{qr} , the average across NUTS-2 regions $x^t_{qr=\bar{r}}$ and the standard deviation across countries $\sigma^t_{qr=\bar{r}}$ are calculated. Standardisation converts the parameters to a common scale with a mean of zero and a standard deviation of one.

2.2.4. Weighting and aggregation

The majority of indicators rely on equal weighting (OECD, 2008) despite the existence of a wide range of weighting techniques. These techniques can be separated into two groups: (i) those based on participatory methods (e.g. budget allocation processes (BAP), analytic hierarchy processes (AHP)), and (ii) those derived from statistical models such as principal component analysis (PCA)/factor analysis (FA) or regression techniques.

As our approach did not involve an active stakeholder involvement during the indicator construction phase, the two options are deriving weights from statistical models or applying equal weights. However, with the latter it might happen that collinear, highly correlated individual parameters act as a kind of double counting. In order to correct for elements of double counting, a principal component factor analysis approach (see e.g. the Product Market Regulation Index, Nicoletti et al., 2000) might be employed to derive weights that account for the degree of variable correlation and thus correct for overlapping information. The suitability of the data structure for the PCA/FA approach was tested by applying the Bartlett's test of sphericity for uncorrelated parameters in combination with the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, as suggested by Tabachnick and Fidell (1989). Only if the Bartlett's test was rejected and the KMO overall measure was higher than 0.60 (Kaiser and Rice, 1974) a PCA/FA was applied.

The PCA/FA approach uses a PCA to extract the first *m* uncorrelated principal components Z_1, Z_2,…Z_q. The Kaiser criterion (i.e. leave out all factors with Eigenvalues < 1.0) has been used as a stopping rule with respect to how many latent factors should be retained. Subsequently a rotation using the "varimax"-method has been applied to enhance the distinctiveness of the factor loadings. Finally, the weights have been derived from the rotated factor loading matrix by taking the square of the factor loadings as a representation of the proportion of the total unit variance of the parameter explained by the factor.

Data aggregation is strongly driven by the issue of compensability among the parameters to be aggregated. The question is whether a low performance of one parameter can be offset (compensated) by a high performance in another parameter. If this mechanism is desirable, then an aggregation method should be chosen where weights express trade-offs between input parameters, such as linear aggregation. If weights should fully remain measures of importance, a non-compensatory logic has to be used, such as multi-criteria based aggregation that, however, only retains ordinal information (OECD, 2008). For our indicators we used a geometric aggregation which is considered an in-between solution as it entails partial (non constant) compensability (ibid). This means that compensability is lower for input parameters with low values but at the same time the marginal utility from increasing low scores is much higher than that of increasing already high scores (Munda & Nardo, 2005). Geometric aggregation takes the following form:

$$CI_r^t = \prod_{q=1}^{Q} I_{qr}^{w_q} \tag{4}$$

where CI is the value of the indicator for a NUTS-2 region *r* at time *t*, calculated as the product of the weighted individual input parameters. As the method requires strictly positive values, a constant of ten was added to the weighted and normalised individual input parameters before applying the geometric aggregation. Furthermore, in case individual input parameters were highly correlated (Pearson's correlation coefficient of 0.5, or greater) the average of the individual normalised input parameters was used for geometric aggregation. For the purpose of data presentation additional aggregation methods were applied (see next section).

2.2.5. Data analysis and presentation

Each indicator is presented spatially explicit as thematic maps. For this purpose the four impact indicators (heat stress, river floods, drought proneness, forest fire danger) and the adaptive capacity indicator were assigned categorical scales, reducing them to an ordinal scale of five classes. The categorical scales were based on percentile thresholds defined as:

$$\begin{array}{ll} \text{"}\textit{Very}\text{ low"} & \textit{if } CI_r^t < P^{20} \\ \text{"}\textit{Low}\text{"} & \textit{if } P^{20} \le CI_r^t < P^{40} \\ \text{"}\textit{Medium}\text{"} & \textit{if } P^{40} \le CI_r^t < P^{60} \\ \text{"}\textit{High}\text{"} & \textit{if } P^{60} \le CI_r^t < P^{80} \\ \text{"}\textit{Very}\text{ high"} & \textit{if } P^{80} \le CI_r^t \end{array} \tag{5}$$

The five classes were visualised using a bi-polar hue progression (Robinson, 1995) from bright red (=very low, bad) to bright green (= very high, good) and have to be interpreted as relative comparisons within Europe. Additionally, for each hazard impact and adaptive capacity were compared to identify hotspots of particular vulnerability. Adaptive capacity represents a set of socio-economic parameters of which some (e.g. GDP) are commonly employed by the EU Commission – Regional Policy for allocating regional policy funding (i.e. convergence regions are defined as having a GDP below 75% of the EU average). To increase the comparability of our results to the EU Regional Policy classification of regions, we therefore decided to modify our thresholds to the same quartile thresholds. Therefore, for the impact indicators Q_3 was used to cut off the highest 25% of the values (with respect to the baseline), whereas regions with low adaptive capacity were defined as those below Q_1. Hotspot regions of vulnerability are those regions where both criteria (i.e. impact > Q_3 AND adaptive capacity < Q_1) are met.

2.3. Comparison with EU Structural Fund allocations

In parallel to the impact assessment presented in this report, an assessment was conducted of the extent of current adaptation-related funding under EU Regional Policy, which is presented in the accompanying report D6.2 (Lung et al., 2011). This was done by analysing allocated funding within the Cohesion Fund, the European Development Fund (ERDF), and the European Social Fund (ESF), for the current programming period 2007-2013, at NUTS-2 level. From the total of 86 EU-defined priority themes, under which funding is available, those with adaptation relevance were selected and further classified and weighted into three groups of importance, according to the RESPONSES WP6 team. Finally, for each group the total amount of allocated funding per capita per NUTS-2 region was calculated (for details see Lung et al., 2011).

For the purpose of comparing EU funding with the hazard-specific impacts as well as with overall hazard impact, only group 1 was taken into account, which represents the allocations under themes considered 'core themes' for adaptation funding. Similar to the adaptive capacity indicator, a threshold value was applied to group 1 to identify those regions with low funding. However, due the skewness of the data (i.e. high allocations for a few regions but low allocations for the majority of regions) a percentile threshold of 0.8 was defined. All regions below this threshold, which represents 23€ per capita, were considered regions with low adaptation funding coming from the current EU Structural Funds. Finally, for each hazard, those low funding regions that in addition are hotspot regions of vulnerability (see section 2.2.5) were identified.

3. Adaptive capacity indicator

3.1. Selection of input variables and indicator construction

As outlined in section 2.1.1, in this study adaptive capacity relates to the potential to enforce and implement planned adaptation measures. Several studies have identified socio-economic factors of which adaptive capacity is a function of. While some of those studies attempt to assess specific aspects such as adaptation in the public financial sector (Mechler et al., 2006) or in business organisations (Berkhout et al., 2006), others report more generic lists of determinants of adaptive capacity (e.g. Smith et al., 2001; Metzger et al., 2006; Ionescu et al., 2009). In a broader sense, the most salient variables can be linked to either of the following components: economic wealth, human skills and education, technology and infrastructure, or institutional capabilities and preparedness. The component of institutional capabilities and preparedness is generally difficult to measure (Greiving, 2006); though recently a proposal for a comprehensive assessment of institutional adaptive capacity has been made (Gupta et al., 2010). However, the proposed framework strongly relies on data collection through stakeholder interviews with qualitative or semi-quantitative output which within the scope of this work was neither accomplishable nor feasible. Therefore, in this study adaptive capacity was defined as a function of the three components (1) financial capital (FC), (2) human capital (HC), and (3) technological capital (TC) (see Figure 3.1).

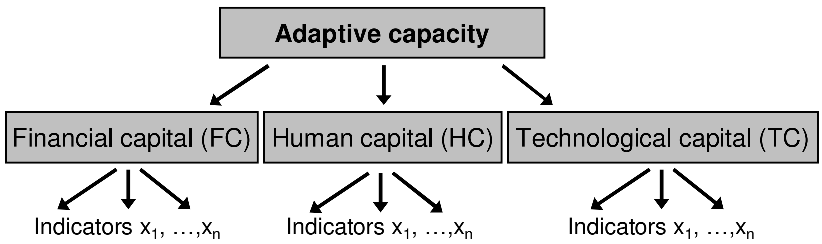

Figure 3.1: Conceptual framework of adaptive capacity indicator.

Following the theoretical framework of this study (see section 2.1.1), adaptive capacity should ideally be measured separately for each hazard type, as the three capitals may have different relevance for the different hazard types (i.e. impacts and response may vary according to hazard type). However, such an approach would require hazard-specific data on financial capital, human capital and technological capital, which in practice is either totally absent or at least not available for all the countries covered in this analysis. As a workaround, parameters have been selected that could potentially be key parameters for all four hazards studied. The resulting adaptive capacity index is therefore considered more or less independent of the hazard-type in the sense that it measures the adaptive capacity of a region in relation to all four hazards in a generic way (cp. similar approaches by Greiving, 2006; Metzger et al., 2006).

Table 3.1: Input parameters for adaptive capacity indicator and their data source.

Capital	Name	Parameter description	Data source
FC	AC_PPS	Gross domestic product GDP [in purchasing power standard, PPS per capita], 2007	EUROSTAT
HC	AC_EDU	Educational attainment [people aged 25-64 with tertiary education, ISCED L5-6], 2008	EUROSTAT
HC	AC_DOC	Health infrastructure [physicians/doctors per capita], 2007[1,2]	EUROSTAT
TC	AC_R&D	Research & development expenditure per capita [business, government, education, non-profit], 2007[3,4]	EUROSTAT
TC	AC_INET	Internet use [percentage of people with internet use from home at least once per week], 2010[5]	EUROSTAT, Onliner Atlas 2010 (GER)

[1] FI: data from 2002; SE: data from 2006
[2] D: NUTS-1 value for corresponding NUTS-2 regions; IE (2 NUTS-2 regions), FI18, FI19, FI1A, all regions of ENG: NUTS-0 value
[3] FR: data from 2004; GR & IT: data from 2005; NL: data from 2003
[4] BE, DE22, DE23: NUTS-2 values derived from NUTS-1 R&D percentage of GDP, NUTS-2 GDP and NUTS-2 population
[5] FR, GR, PL, SI and partly DE: NUTS-1 value for corresponding NUTS-2 regions

For financial capital (FC), regional GDP expressed in purchasing power standard (PPS) was used as parameter (see Table 3.1). A plethora of previous studies have shown the usefulness of GDP not only for vulnerability and adaptive capacity assessments (e.g. Greiving, 2006, Metzger et al., 2006, Ionescu et al., 2009, Iglesias et al., 2011) but also for other European regional comparison studies (e.g. Regional Competitiveness Index (RCI), Annoni and Kozovska, 2010). The second component, human capital (HC), covers aspects of health care and education. As a general proxy of health infrastructure and to account for the capacity of each region to provide emergency aid in the event of severe impacts of weather extremes, 'doctors per capita' was selected. Regarding educational attainment, the share of population with tertiary education according to ISCED standard was chosen instead of the commonly used variable 'literacy rate'. The latter parameter is recommended for global scale national comparisons (Brooks et al., 2005), but in our analysis it was found to show little differences among European regions. The third component, technological capital (TC) was captured by expenditures for research and development as well as by internet use (Table 3.1). The latter is considered a good proxy for people's access to online emergency information or early warning systems, such as the European Forest Fire Information System (EFFIS) (http://effis.jrc.ec.europa.eu/).

Indicator construction based on the five selected input parameters followed the steps outlined in section 2.2. In some cases data from another year had to be used or the NUTS-1 or NUTS-0 value was applied for the corresponding NUTS-2 regions (see Table 3.1). For the health infrastructure (AC_DOC) statistics of England, the nation-wide average value had to be used for all its 30 NUTS-2 regions, since data on a finer spatial resolution was unavailable and no other suitable dataset was found to derive such a break-down. The correlation matrix shows strong bivariate correlations above 0.5 for most of the input parameters (see Table 3.2). A KMO value of 0.70 in combination with the rejection of the Bartlett's test revealed the suitability of the data structure for a PCA/FA approach to derive weights that correct for the effect of overlapping information. The Eigenvalues of the correlation matrix of the five individual variables show that the first principal component explains 61.8% of the variance in the dataset and that the first two components together explain 83% of the total variance (see Table 3.3). The remaining three components only account for 17% of the total data variance.

Table 3.2: Correlation matrix for adaptive capacity input parameters.

	AC_PPS	AC_EDU	AC_DOC	AC_R&D	AC_INET
AC_PPS	1.00				
AC_EDU	**0.57**	1.00			
AC_DOC	0.44	0.21	1.00		
AC_R&D	**0.67**	**0.55**	0.20	1.00	
AC_INET	**0.62**	**0.65**	-0.03	**0.58**	1.00

Table 3.3: Eigenvalues of adaptive capacity input parameters.

	Eigenvalue	% of variance	Cumulative %
PC1	3.09	61.8	61.8
PC2	1.06	21.2	83.0
PC3	0.45	9.0	92.0
PC4	0.22	4.4	96.4
PC5	0.18	3.6	100.0

Table 3.4: Component loadings of adaptive capacity input parameters.

	PC1	PC2	PC3	PC4	PC5
AC_PPS	**0.90**	0.17	-0.24	-0.15	-0.28
AC_DOC	0.40	**0.89**	0.12	0.19	0.04
AC_EDU	**0.80**	-0.17	0.49	-0.12	0.00
AC_R&D	**0.91**	0.00	-0.24	-0.13	0.30
AC_INET	**0.81**	-0.46	-0.07	0.35	0.03

Note: extraction method = PCA, loadings greater than 0.5 are highlighted, n = 261 NUTS-2 regions

As can be seen from the component loadings of the five input variables (Table 3.4) the first component PC1 accounts for four of the five variables while health infrastructure (AC_DOC) is loaded on the second component. Applying the Kaiser criterion, the first two latent factors were retained and then rotated to enhance the interpretability of the factorial axes, using the varimax rotation method. After rotation, the data structure with four variables on axis one and AC_DOC on axis two was confirmed (see Table 3.5). Weights were derived given that the square of the rotated factor loadings is the proportion of the total unit variance of each variable explained by the factor (OEDC, 2008). First, for each rotated factor the proportion of the explained variance in the dataset (Explained/Total) was calculated (e.g. for the first factor 2.86/(2.86+1.29)=0.70, see Table 3.5). Then, each squared factor loading was multiplied with the Explained/Total of the factor it is loaded on and finally re-scaled to sum up to 1 (e.g. for AC_PPS: 0.22 · 0.70 = 0.149, after rescaling = 0.163). The method generates, as expected, the highest weight for health infrastructure (AC_DOC) as this is the parameter with the weakest bivariate correlations and hence least overlapping information with the other input variables. In contrast, AC_PSS, with on average the highest correlations (see Table 3.2), is assigned the lowest weight. After assigning the weights, the five parameters were aggregated using the standard geometric aggregation as described in section 2.2.4 to produce the final adaptive capacity indicator.

Table 3.5: Rotated factor loadings based on principal components and derived weights.

	Factor loadings[1]			Squared factor loadings (scaled to unity sum)[2]		
	RC1	RC2	hc2	RC1	RC2	Weights[3]
AC_PPS	**0.79**	0.46	0.83	**0.22**	0.17	**0.163**
AC_DOC	0.08	**0.97**	0.95	0.00	**0.76**	**0.248**
AC_EDU	**0.81**	0.11	0.67	**0.23**	0.01	**0.174**
AC_R&D	**0.86**	0.31	0.83	**0.26**	0.08	**0.194**
AC_INET	**0.92**	-0.17	0.87	**0.29**	0.02	**0.222**
Explained variance	*2.86*	*1.29*				
Cumulative [%]	*57*	*83*				
Explained/Total	*0.70*	*0.30*				

[1] Note: extraction method = PCA, varimax normalized rotation, positive loadings greater than 0.5 are highlighted
[2] Note: the square of factor loadings represents the proportion of the total unit variance of the parameter that is explained by the factor
[3] Note: derived by multiplying each squared factor with 'Explained/Total' and finally rescaling all weights to sum up to 1

3.2. Results

The adaptive capacity indicator shows a clear division between eastern and western Europe as well as a decrease of adaptive capacity towards southern European regions (see Figure 3.2a). Most NUTS-2 regions classified as 'very low' are found in Poland, Hungary, Romania, Bulgaria, Greece, southern Italy and Portugal. Regions of category 'low' are found in Latvia, Lithuania, some (north-) eastern German regions, most regions of the Czech Republic and Slovakia, some Greek regions, Cyprus, some southern Spanish regions, a number of Italian regions particularly in the north, the regions surrounding Paris in northern France, as well as some regions in the UK. No clear pattern is found for the areas assigned a 'medium' adaptive capacity. These areas are spread across mainly western and central Europe. Regions with high adaptive capacity are primarily found in northern Europe, the UK, Belgium, the Netherlands, southern Germany, Austria, southern France and also northern Spain. Highest adaptive capacity is revealed mainly in Scandinavia, in the southern UK around London, in the Netherlands and Belgium, as well as in southern Germany.

Furthermore, the indicator shows a distinctive pattern for many of Europe's capital regions, mostly standing out with clearly higher adaptive capacity compared to their neighbouring regions, such as the Lisbon region with high adaptive capacity while its surrounding regions have been classified as 'very low' (see Figure 3.2). Other examples with a similar pattern are Paris (NUTS-2 region 'Île de France'), Madrid, Rome (NUTS-2 'Lazio'), Berlin, Prague, Vienna, Bratislava, Budapest (NUTS-2 'Közép-Magyarország'), Bucharest, Sofia (NUTS-2 'Yugozapaden'). The highest difference between a capital region and its surroundings is revealed for Athens ('very high' vs. 'very low' for surrounding regions).

A comparison of the spatial distribution of adaptive capacity with the allocations of financial resources per capita for climate change adaptation measures and risk prevention within the Structural funds and the Cohesion Fund reveals a negative correlation (see Figure 3.2b). In general, regions with low adaptive capacity tend to have been dedicated an above average amount of financial resources to adaptation while financial resources from the EU are below average for regions with medium, high, or very high adaptive capacity. Exempted from this pattern are some regions in northern and eastern Germany, large parts of northern France, the central parts of Spain, the northern part of Italy, southern Bulgaria, as well as Cyprus and Lithuania. These regions show a below average adaptive capacity and an EU financial aid for climate change adaptation of not more than 25€ per capita.

3.3. Discussion

The revealed pattern of adaptive capacity strongly resembles the spatial distribution of economic strength and wealth in Europe. This is not surprising since the multivariate data analysis confirmed that the different input parameters (apart from health infrastructure) measure a common latent phenomenon. For instance, regions that include the capital cities of the different Member State countries are usually also the centres of finance and economy, education, and research, and these usually score high in most of the five parameters the adaptive capacity indicator is composed of. This phenomenon is amplified for a number of cases where the spatial extent of capital regions is delimited by the urban area of the capital itself (e.g. Paris, London, and Budapest) and does not reflect a mixture of urban and rural areas, as is the case for many other NUTS-2 regions.

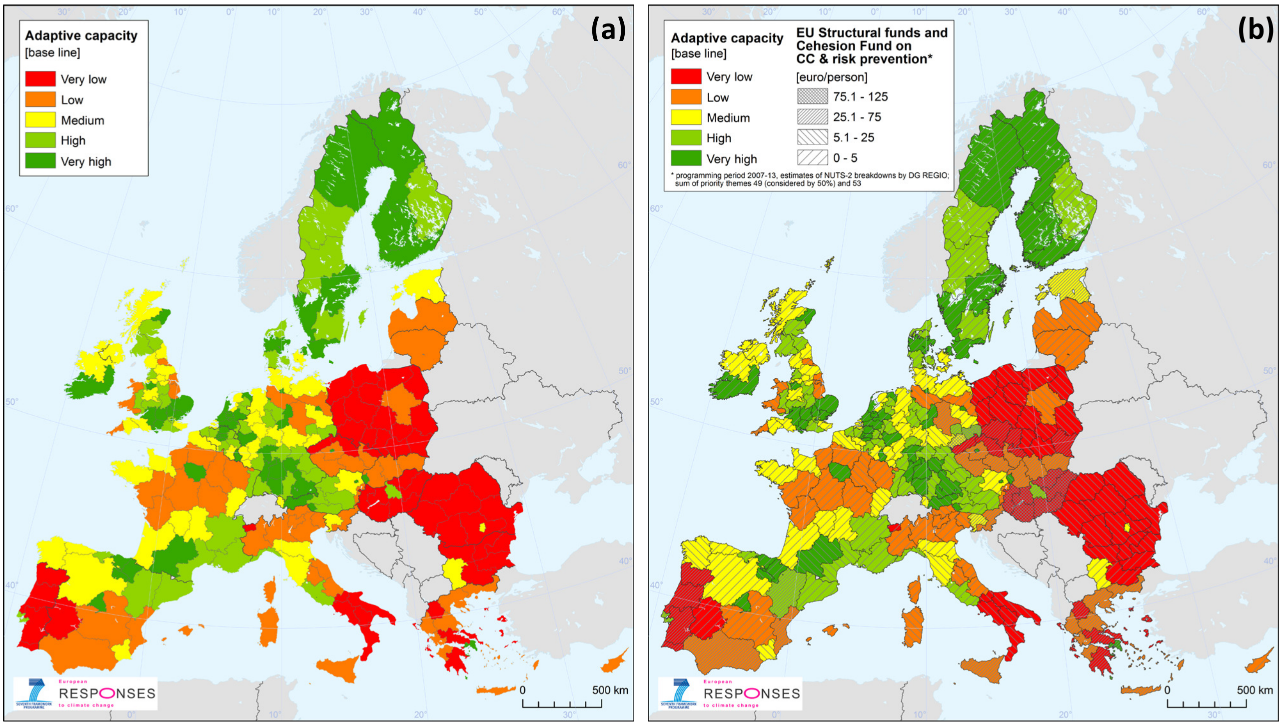

Figure 3.2: (a) Map of adaptive capacity indicator at pan-European NUTS-2 level, (b) adaptive capacity indicator together with allocations on climate change & risk prevention within EU Structural funds / Cohesion Fund (estimated from DG Regio NUTS-2 breakdowns).

A comparison with the adaptive indicator developed by Metzger et al. (2006) shows a reasonably high match with their baseline results for the year 2000. Nevertheless, in some areas marked differences are found, for example for Ireland, Austria and the northern part of Italy, some of which are believed to represent some recent developments. For instance, for northern Italy the results of this study reveal lower adaptive capacity than that modelled by Metzger et al. (2006), suggesting that the 'blue banana' by R. Brunet (Faludi, 2009) could have lost its Italian fraction. The main drivers for the low score in Italy are a low educational attainment and a low rate of Internet use, both showing an increased gap to European average within the last ten years (data from EUROSTAT). The low or very low scores for most eastern European regions reflect the still existing gap in well-being and competitiveness compared to western Europe, though this gap has slightly decreased over the last years (e.g. von Breska, 2010). However, despite a low adaptive capacity the amount of EU financial aid earmarked for climate change adaptation seems to be quite limited for some of those regions (e.g. Romania and Bulgaria).

Adaptive capacity is a multi-dimensional concept determined by and interlinked with a variety of processes, sometimes working in different directions. In order to reduce uncertainties in predicting future states, indicators of adaptive capacity are found to be more useful when the current (baseline) situation is taken, even though there is some contradiction when combining the current adaptive capacity with projected climate change impact (Vincent, 2007). Obviously, adaptive capacity is also likely to change over time. Another obstacle for this study is that projections of the selected input parameters (Table 3.1) are not available, at least not at a pan-European scale. Metzger et al. (2006) employed regression models based on the SRES storylines to overcome this problem, but at the same time these authors admit a high uncertainty associated with this technique.

For this study we therefore decided to limit the adaptive capacity indicator to the current, observed state and to contrast it with potential future climate impacts from the two scenario periods in order to derive hazard-specific hotspots of climate change vulnerability. By doing so, we hypothetically assume adaptive capacity to be able to largely compensate for any hazard impact and to be strongly related to actual adaptive action. This simplified assumption is unlikely to be encountered in reality and other studies have emphasised significant deficiencies in climate change preparedness, even among regions assumed to have great adaptive capacity (Preston et al., 2010). Furthermore, the methodology implies that regions with an adaptive capacity surpassing the defined threshold (i.e. the first quartile, see section 2.2.5) will never be flagged as vulnerability hotspot regions, regardless how strong the hazard impact might be. However, for the purpose of initially flagging regions potentially in need of specific attention in the context of EU regional development policy with regard to climate change impacts, the approach is deemed appropriate. Nonetheless, the vulnerability hotspot results should be interpreted in conjunction with the hazard-specific impact results to derive a balanced picture of potential pan-European climate change impacts.

4. Hazard-specific impact indicators and vulnerability hotspots

4.1. Heat stress

4.1.1. Selection of input variables and indicator construction

Impacts of temperature extremes on human health are not only driven by hot days, but also by a number of additional factors of which heat wave duration and night-time minimum temperature are amongst the most important (Fischer and Schär, 2010). While warm nights are known to amplify heat stress as they hamper the recovery from daytime heat, severe impact arises also from multi-day heat waves that have been found to explain sharp increases in daily mortality, e.g. during the 2003 European heat wave (Vandentorren et al., 2004). In order to account for these factors we have chosen three heat-related exposure parameters, relating to the summer months June, July and August:

- Summer days; defined as the number of days with a temperature (2m above ground) above 25°C (HE_T2MAX25);
- Tropical nights; defined as nights with a minimum temperature (2m above ground) higher than 20°C (HE_T2MIN20);
- The frequency of occurrences of 7-day heat waves (HE_HDWI) according to the Heat Wave Duration Index (Frich et al., 2002) (see Table 4.1).

It has been shown that heat is a major health risk in particular for elderly people over the age of 65 to 75 years (e.g. Rey et al., 2007; Baccini et al., 2011), especially if they live geographically and/or socially isolated (Toulemon and Barbieri, 2008). To approximate these socio-economic factors that influence the extent of each region's sensitivity to temperature extremes in relation to human health, we have chosen (a) the percentage of elderly people at an age over 75 years (HS_POP75), and (b) the percentage of households composed of a single adult over 65 years (HS_HH65) per NUTS-2 region. In addition, the so-called urban heat island (UHI) effect due to well-known factors such as the substitution of green areas with impervious surfaces (Takebayashi and Moriyama, 2007) or the decrease in urban albedo (Akbari and Konopacki, 2005) cause marked differences in temperatures between highly urbanised and rural areas. As a proxy for the degree of urbanisation, each NUTS-2 regions' mean population density (HS_POPD) was considered. In total, the heat stress impact indicator is thus composed of six input parameters, each three on exposure and sensitivity (see Table 4.1).

Table 4.1: Input parameters for heat stress indicator, their temporal coverage, and data sources (HE = heat exposure input, HS = heat sensitivity input).

Name	Description	Temporal coverage			Data source
		Baseline	Scenario1	Scenario2	
HE_T2MAX25	Number of summer days with T_{max} > 25°C in summer period (June, July, August)	1961-90	2011-40	2041-70	ENSAMBLES-project, 5 RCMs[1]
HE_T2MIN20	Number of tropical nights with T_{min} > 20°C in summer period (June, July, August)	1961-90	2011-40	2041-70	see above
HE_HWDI	Number of 7-day heat wave events in summer period (June, July, August) [2]	1961-90	2011-40	2041-70	see above
HS_POP75	Percentage of elderly people > 75 years	2007[4]	2030	---	EUROSTAT (2030: EUROPOP2008)
HS_HH65	Percentage of households composed of one adult > 65	2008	---	---	EUROSTAT
HS_POPD	Population density	2007[3]	2030	---	EUROSTAT (2030: EUROPOP2008)

[1] for details see Table 2.1

[2] based on the Heat Wave Duration Index (HWDI) (Frich, 2002) and defined as the frequency of occurrences of 7 successive days at which the daily maximum temperature exceeds the mean 30-year period temperature of a 5-day window by 5°C defined as:

$$T2MAX_i^{period} > \frac{1}{5}\sum_{n=i-2}^{i+2} T2M^{period} + 5$$

In order to avoid the inclusion of "pseudo-heat waves" (i.e. cases when the above criteria are met but on a low temperature level), areas with a mean Tmax < 20°C during the summer months June, July and August (e.g. areas in northern Europe) have been excluded prior to the analysis.

[3] data from 2006 for AT, ES, LU, MT and PL

[4] data from 2005 for PT and from 2008 for PL

Indicator construction followed the general methodology outlined in section 2.2, with some adjustments. None of three sensitivity parameters covers all three time periods (see Table 4.1). While for scenario 1

HS_HH65 of the baseline had to be used, for scenario 2 HS_POPD and HSPOP75 of scenario 1 (2030) and again HS_HH65 of the baseline were taken. Since HS_HH65 was only available at country level, a data imputation approach based on statistical estimates was applied that was recently employed for the Regional Competitiveness Index (RCI) (Annoni and Kozovska, 2010) and the assessment of the Regional Innovation Scoreboard (Hollanders et al., 2009). The method relies on the assumption that one or several 'reference variables' can be used that have significant correlation(s) with the variable only available at national level ($Y^{national}$). These reference variables must have both national ($X^{national}$) and regional values ($X^{regional}$, NUTS-2 in our case) available and consequently for each region a ratio can be calculated:

$$r_j^i = \frac{X_i^{national}}{X_{ij}^{regional}} \quad (6)$$

where $X_i^{national}$ is the value of variable X_i at country level and $X_{ij}^{regional}$ is the value of X_i in region j. The missing value for region j of variable Y is finally imputed as:

$$Y_j^{regional} = \frac{Y^{national}}{r_j} \quad (7)$$

The procedure spreads the national values of variable Y across the regions according to the relation of each regional variable with respect to its country variable. As reference variable we chose 'percentage of people over 65 years' (calculated from EUROSTAT data) which is significantly correlated with HS_HH65 at the national level (Pearson's correlation coefficient of 0.47, $p<0.05$) but not directly used in the heat indicator (though HS_POP75 is very similar to it). The national-to-regional-ratios of the reference variable where then used to spread the national values of HS_HH65 across the NUTS-2 level.

Table 4.2: Correlation matrix for heat exposure (HE) and heat sensitivity (HS) parameters

	HE_T2MAX25	HE_T2MIN20	HE_HDWI		HS_POPD	HS_POP75	HS_HH65
HE_T2MAX25	1.00			HS_POPD	1.00		
HE_T2MIN20	**0.85**	1.00		HS_POP75	-0.19	1.00	
HE_HDWI	-0.15	-0.37	1.00	HS_HH65	0.02	**0.53**	1.00

Note: n=261, Pearson's correlation coefficient, correlations > 0.5 in bold

Both HE_T2MIN20 and HS_POPD showed skewness and kurtosis values still above the defined thresholds after winsorising 5% of the values of the datasets. Therefore Box-Cox transformations were applied with iteratively derived λ-values of -0.1 for HE_T2MIN20 and of 0.3 for HS_POPD. Furthermore, for the exposure parameters HE_T2MAX25 and HE_T2MIN20 as well as for the sensitivity parameters HS_POP75 and HS_HH65 an average of the normalised values was calculated prior to data aggregation as both pairs of parameters show correlation coefficients above 0.5 (see Table 4.2).

4.1.2. Results

The spatial distribution of modelled heat stress for the baseline period reveals that Germany, France and northern Italy are areas with the highest potential impact according to this indicator (see Figure 4.1a). Other areas with high or very high impact are expected in southern UK, the southern areas of the Netherlands, Belgium, parts of Portugal and southern Italy. A distinctive pattern is also seen for highly urbanised NUTS-2 regions such as London, West Midlands (Birmingham), Hamburg, Prague, Vienna, Budapest, Bucharest, Athens, Madrid and Lisbon. Whereas for adaptive capacity most of these regions show an exceptionally good (i.e. high) performance relative to their surroundings (cp. Figure 3.2a), in terms of heat stress they stand out as negative (i.e. high impact) regions in relation to their neighbouring regions. In contrast, areas with low heat stress are Ireland, the northern part of the UK, Scandinavia and the Baltic States, large parts of eastern Europe, the Alps, as well as some Greek regions and large parts of Spain.

For Scenario 1 (period 2011-2040), impacts in countries with already high indicator values in the baseline are projected to further increase (e.g. Italy and France) or slightly expand (e.g. northern regions of Germany now also highly impacted) (see Figure 4.1b). However, the strongest negative change towards high impact is predicted in central-eastern Europe (southern Poland, Czech Republic, Slovakia and Hungary). For

Scenario 2 (period 2041-2070), the trend towards increasing heat stress is confirmed for almost all parts of Europe (see Figure 4.1c). While most regions now show a high or very high impact, areas remaining with low impact are Ireland, the northern UK, most parts of Scandinavia, the Baltic States, the Alps, and some regions in Spain. The overall trend towards a considerably stronger heat stress is also reflected by the projected long-term change from the baseline to 2041-2070 (see Figure 4.1d). While very few regions show a reduction in heat-related impacts, particularly in eastern Europe a sharp increase can be seen.

The overlay of heat stress with adaptive capacity for the baseline reveals five southern Italian regions and two Portuguese regions as hotspots of heat vulnerability (see Figure 4.1a, Table 4.3). Four of the five Italian regions are additionally below the 0.8 percentile threshold of current EU financing (Structural Funds and Cohesion Fund, core themes, see section 2.3) for climate change adaptation. Performing the same overlay with the impact Scenario 1 (2011-2040) shows that, if current adaptive capacity would remain the same, in total 20 NUTS-2 regions would be considered as vulnerability hotspots (see Figure 4.1b, Table 4.3). Of those 20 regions, which are all found in southern Italy or eastern Europe, for 11 currently low EU funding is provided. For Scenario 2 (2041-2070) the number of vulnerability hotspot regions would further increase to 28 (see Table 4.3), now also including two regions in Bulgaria (see Figure 4.1c).

Table 4.3: Potential heat stress vulnerability – hotspot NUTS-2 regions for baseline period as well as scenario periods 1 (2011-2040) and 2 (2041-2070) ('✓' = region is a hotspot, 'no' = region is not a hotspot; in parentheses the distance to the baseline EU-mean heat impact in percentage).

ID	NUTS-2 name	Baseline	Scenario 1	Scenario 2
BG31	Severozapaden	no (+1.8)	no (+1.3)	✓ (+5.1)
BG42	Yuzhen tsentralen	no (-0.3)	no (+0.7)	✓ (+3.0)
CZ02	Strední Cechy	no (-0.8)	✓ (+3.8)	✓ (+5.4)
CZ03	Jihozápad	no (-2.3)	no (+1.2)	✓ (+4.4)
CZ04	Severozápad	no (-0.3)	✓ (+4.4)	✓ (+4.2)
CZ05	Severovýchod	no (-1.3)	✓ (+3.5)	✓ (+6.0)
CZ07	Strední Morava	no (-1.8)	no (+2.2)	✓ (+2.5)
CZ08	Moravskoslezsko	no (-1.6)	✓ (+3.0)	no (+0.5)
HU23	Dél-Dunántúl	no (-2.5)	no (+1.4)	✓ (+2.6)
HU31	Észak-Magyarország	no (-1.0)	✓ (+2.6)	no (+1.7)
HU32	Észak-Alföld	no (-1.3)	no (+2.3)	✓ (+2.6)
HU33	Dél-Alföld	no (-1.0)	✓ (+4.6)	✓ (+5.1)
ITF1	Abruzzo	no (+2.4)	✓ (+4.8)	✓ (+4.8)
ITF2	Molise	✓ (+4.7)	✓ (+6.6)	✓ (+4.8)
ITF3	Campania	✓ (+3.3)	✓ (+4.0)	✓ (+4.2)
ITF4	Puglia	✓ (+3.0)	✓ (+4.6)	✓ (+4.7)
ITF5	Basilicata	no (+2.2)	✓ (+3.8)	✓ (+3.6)
ITF6	Calabria	✓ (+2.5)	✓ (+4.3)	✓ (+4.8)
ITG1	Sicilia	✓ (+3.3)	✓ (+4.3)	✓ (+5.0)
ITG2	Sardegna	no (+0.7)	✓ (+3.8)	✓ (+4.3)
PL11	Lódzkie	no (+0.2)	✓ (+2.5)	✓ (+3.9)
PL21	Malopolskie	no (-1.2)	✓ (+3.9)	no (+1.4)
PL22	Slaskie	no (-0.5)	✓ (+5.0)	✓ (+3.9)
PL31	Lubelskie	no (-0.4)	✓ (+2.9)	✓ (+4.0)
PL32	Podkarpackie	no (-0.9)	✓ (+3.8)	no (+2.0)
PL33	Swietokrzyskie	no (-0.3)	✓ (+4.0)	✓ (+4.2)
PL51	Dolnoslaskie	no (-0.6)	no (+0.8)	✓ (+4.4)
PL52	Opolskie	no (-1.8)	no (+0.8)	✓ (+3.1)
PT15	Algarve	no (-0.6)	no (-1.0)	✓ (+3.0)
PT16	Centro (PT)	✓ (+2.6)	no (+1.7)	✓ (+4.6)
PT18	Alentejo	✓ (+2.7)	no (+0.9)	✓ (+3.5)
SK02	Západné Slovensko	no (-2.5)	no (+2.3)	✓ (+3.1)
total number of hotspot regions:		7	20	28

4.1.3. Discussion

The patterns of heat impact revealed by this study are different from the results of other climate change impact studies, that project the most heavily affected areas to be in southern Europe (e.g. Koffi and Koffi, 2008; Fischer and Schär, 2010). Indeed, our study predicts strongest heat stress related to human health for France, Germany, and, possibly further into the future, for eastern Europe, while areas such as the Iberian Peninsula reveal only medium to low impact. These at first glance contradicting results can however be explained by the fact that the current work has followed a different approach then studies based only on

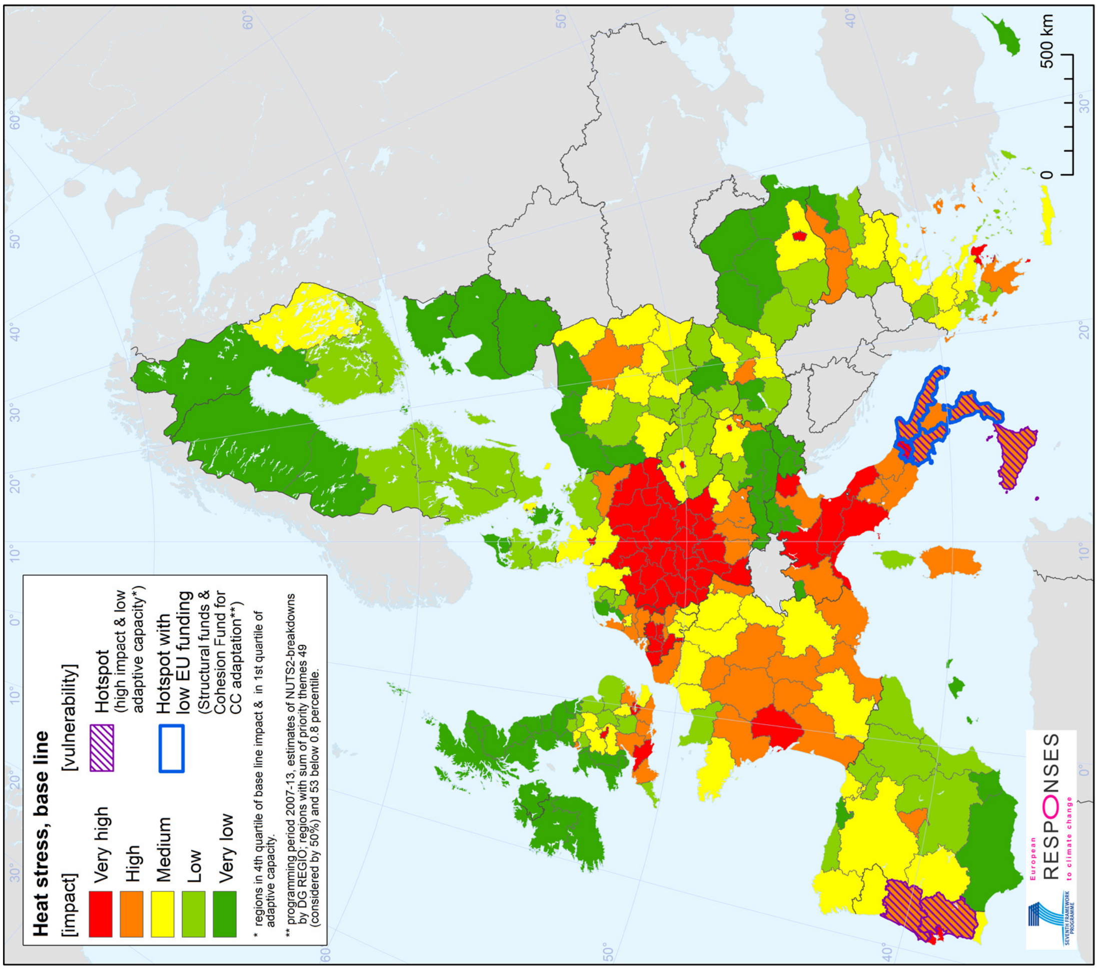

Figure 4.1(a): Map of heat stress together with vulnerability hotspots, at NUTS-2 administrative level for EU27, baseline period.

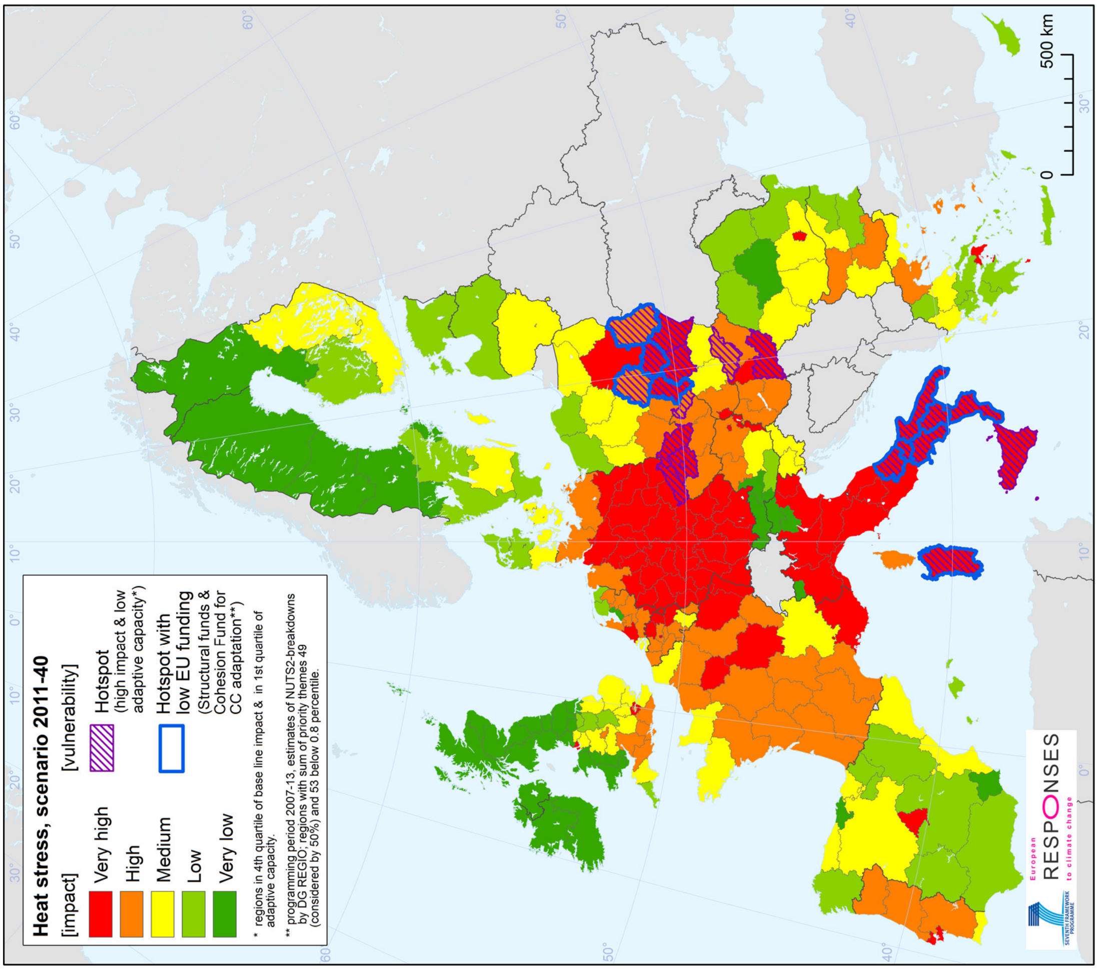

Figure 4.1(b): Map of heat stress together with vulnerability hotspots, at NUTS-2 administrative level for EU27, scenario period 2011-2040.

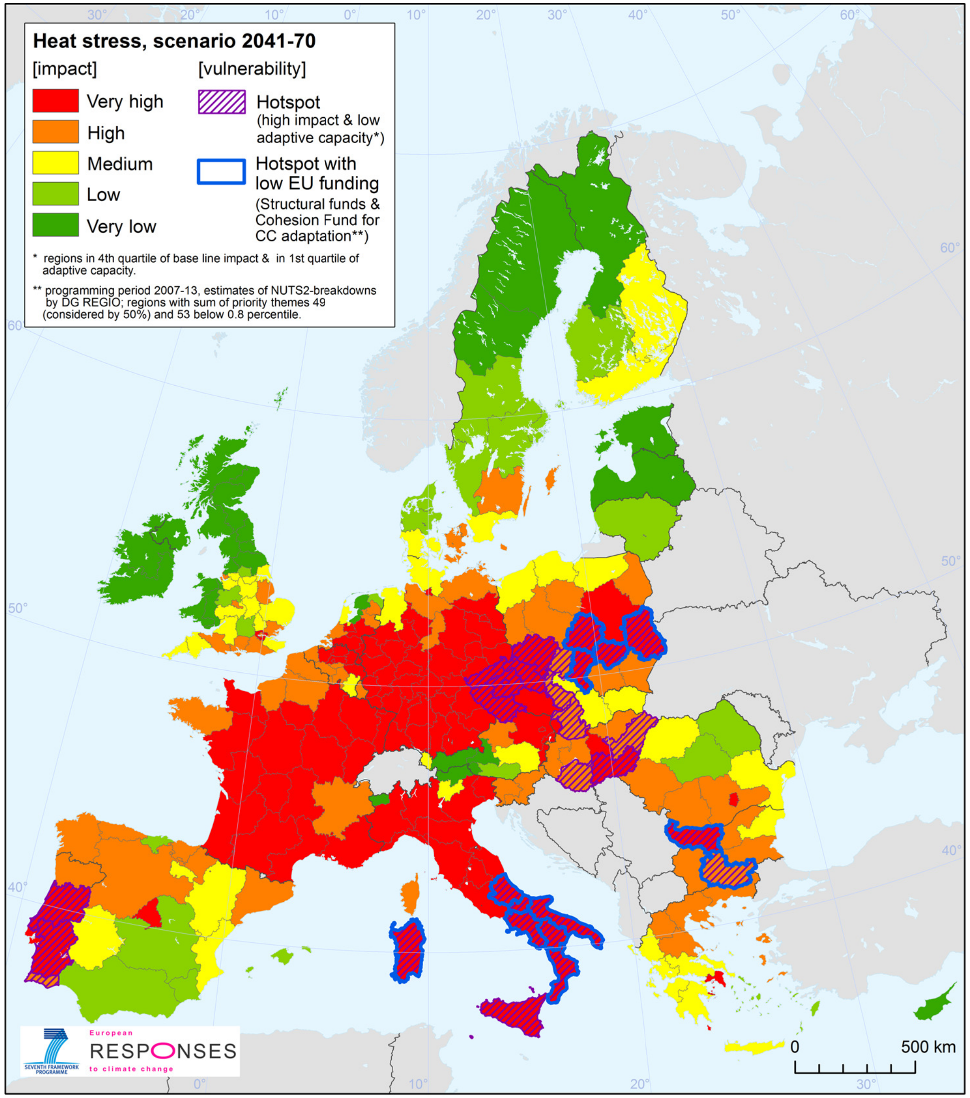

Figure 4.1(c): Map of heat stress together with vulnerability hotspots, at NUTS-2 administrative level for EU27, scenario period 2041-2070.

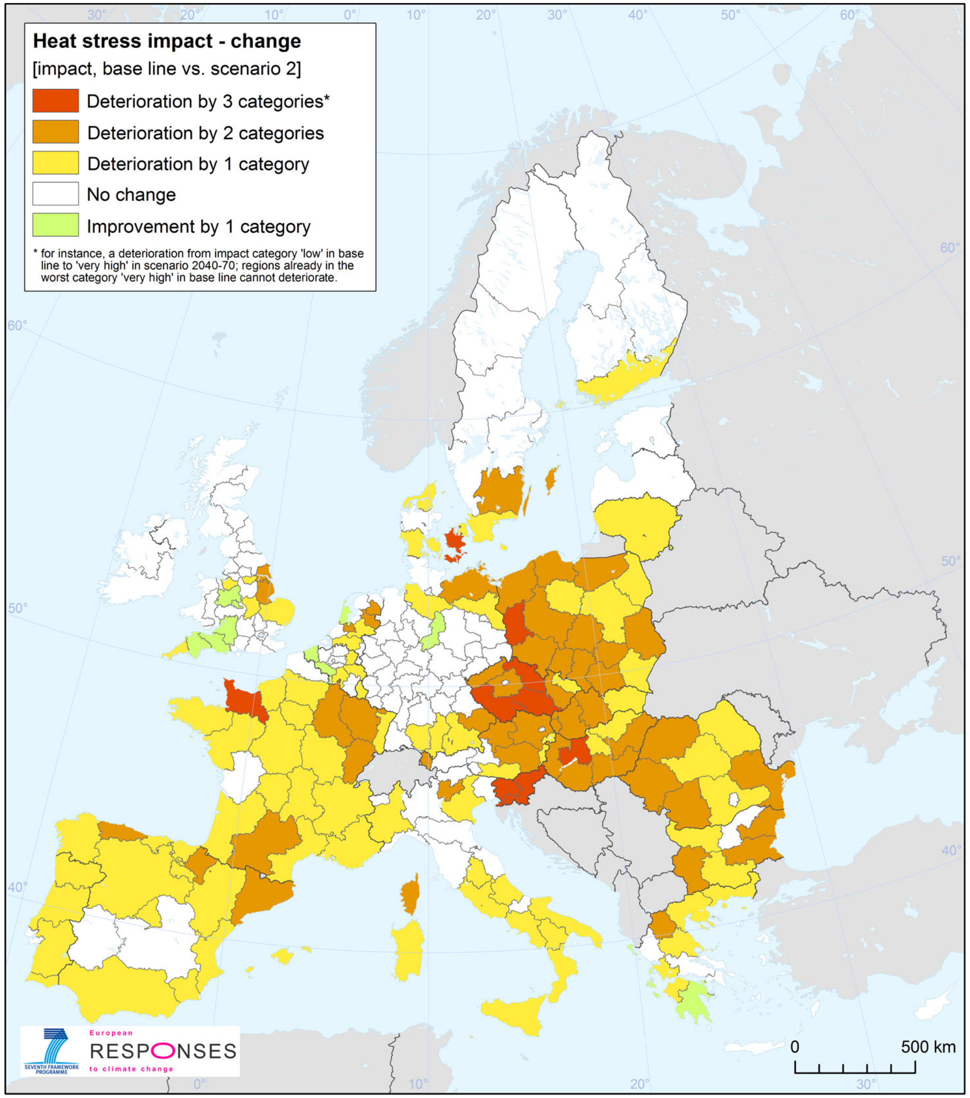

Figure 4.1(d): Map of projected change in heat stess, from baseline to scenario 2041-2070, at NUTS-2 administrative level for EU27.

climate parameters. More specifically, we have integrated the output from climate models with socio-economic data on population structure to explore the combined effect of variations within Europe in heat impacts. Consequently, the resulting patterns reflect the climate exposure in combination with the sensitivity of the population to heat stress.

In particular for Germany and Italy the high impact is strongly influenced by a high percentage of people at an age higher than 75 years (HS_POP75) and a high percentage of people in single households at an age higher than 65 (HS_HH65), in combination with medium to high values for some climate exposure parameters. In contrast, Spain has one of the lowest rates of elderly people in Europe and additionally the percentage of them that live alone living in single person households is low as well. Another example of population characteristics driving the heat impact is the highly urban NUTS-2 regions that stand out as isolated regions of very high impact (cp. Figure 4.1a-c). These areas are heavily influenced by the parameter population density (HS_POPD), thus reflecting the well known heat island effect (Susca et al., 2011). In addition, the HWDI defined by Frich et al. (2002) (i.e. the number of at least six successive days when daily maximum temperature exceeds mean temperature of a 5-day window calculated over the base period by 5°C) as climate exposure parameter on the resulting overall impact pattern. The HWDI shows highest values in central Europe and not in southern Europe where the 5°C temperature exceedance criterion is more difficult to reach. Therefore, this parameter was deliberately chosen to account for the fact that heat stress is triggered if heat occurs as an extraordinary event as opposed to temperature events that people are generally used to cope with.

4.2. River floods

4.2.1. Selection of input variables and indicator construction

Some of the most widely used parameters in flood risk and impact assessments are those characterising the actual flood hazard such as inundation extent and depth (e.g. Büchele et al., 2006; Messner and Meyer, 2006). A key requirement for quantifying flood hazard frequencies and intensity is the availability of spatially distributed event parameters for different recurrence intervals. Europe-wide hazard intensity from river flooding has been derived in other studies from observed flood events (Schmidt-Thomé et al., 2006), as well as from hydrological model simulations. The latter technique can also be used to assess climate change impacts, by using the output of regional climate models. Such an assessment was for instance conducted with flood simulation model LISFLOOD (van der Knijff et al., 2010), which translates weather parameters such as temperature, precipitation, radiation and humidity into estimates of river runoff. Typically, 100-year return levels of river discharge are used as main parameter for assessing flooding events (Dankers and Feyen, 2008; Dankers and Feyen, 2009), thereby assuming that events with higher frequency do not lead to significant and damaging flooding. Peak discharges for a recurrence interval of T=100 correspond to an exceedance probability of one percent per year. Recently, a similar set-up with the LISFLOOD model and using the ENSEMBLES RCM climate simulation DMI_HIRHAM5_ECHAM5 has been published by Rojas et al. (2011) and their results have been used for this work to compute two climate exposure parameters, percentage of flooded area (FE_AREA) and mean water depth (FE_DPTH) (see Table 4.4).

Table 4.4: Input parameters for flood risk indicator, their temporal coverage, and data sources
(FE = flood exposure input, FS = flood sensitivity input).

		Temporal coverage			
Name	**Description**	Baseline	Scenario1	Scenario2	**Data source**
FE_AREA	Percentage of flooded area, recurrence interval of a 100-year event flood	1961-90	2011-40	2041-70	LISFLOOD simulation model run with ENSEMBLES DMI_HIRHAM_ECHAM5 data (Rojas et al., 2011)
FE_DPTH	Mean water depth [in m] of flooded area, recurrence interval of a 100-year event flood	1961-90	2011-40	2041-70	see above
FS_POPD	Population density within areas affected by 100-year recurrence interval flood	2006	---	---	see above & disaggregated population density map (Gallego, 2010; updated with CLC 2006)
FS_COM	Percentage of commercial & industrial areas affected by 100-year recurrence interval food	2006	2020	---	see above & CLC (2006); EU-CLUE Scanner, 100x100m version (2020)

In other studies flood risk is calculated on the basis of inundation extent and depth, and information on the elements at risk, usually the distribution of population and assets (Apel et al., 2009). A previous pan-

European study by Barredo et al. (2007) used the population density at NUTS-2 level as a proxy for this purpose. In order to more accurately account for the actual distribution of population within each NUTS-2 area, we used a disaggregated population density map of Gallego (2010), derived from CORINE 2000 land-use data. For this study, a version of the disaggregated population density map updated with CORINE 2006 (for all countries except for Greece and the UK) was used and spatially intersected with the 100-year recurrence interval flood extent from Rojas et al. (2011). As a proxy for flood impact on non-residential facilities, an intersection of the flood extent with the commercial and industrial areas of a refined CORINE 2006 version (Batista e Silva et al., submitted) was performed. The same information from a land use simulation of the EU-CLUE Scanner (Lavalle et al., 2011a) for 2020 was used. All employed datasets have the same spatial resolution of 100 x 100 m.

As LISFLOOD does not model some areas, five NUTS-2 regions were excluded from the flood analysis[1]. Additionally, disaggregated population information is only available for the baseline (see Table 4.4). Consequently, for deriving FS_POPD for the two scenarios the dataset of 2006 had to be intersected with the simulated flood extents. Likewise, the simulated commercial and industrial areas of 2020 had to be used for scenario 2. As neither the two exposure parameters nor the two sensitivity parameters do show a correlation coefficient above 0.5 (see Table 4.5) all four parameters were directly used for geometric aggregation.

Table 4.5: Correlation matrix for flood exposure (FE) and flood sensitivity (FS) parameters.

	FE_AREA	FE_DPTH		FS_POPD	FS_COM
FE_AREA	1.00		FS_POPD	1.00	
FE_DPTH	0.46	1.00	FS_COM	0.34	1.00

Note: n=261, Pearson's correlation coefficient

4.2.2. Results

Flood risk from river floods for the baseline period (1961-1990) reveals a diversified picture throughout Europe. While most regions in southern Europe (Iberian Peninsula, southern France, southern Italy and Greece) as well as north-western Europe (Ireland, Scotland, Scandinavia) show very low or low risk, the strongest risk is found in central Europe, parts of England and south-eastern Europe (see Figure 4.2a). In many parts of Europe the pattern of risk is patchy, with NUTS-2 regions of high or very high risk adjacent to regions with low to very low risk, reflecting the hydro-geographical setting of Europe that is the major river systems with their catchments. For instance, a cluster of regions with high or very high risk can be found along the course of the Danube from southern Germany through Austria / Slovakia and Hungary to southern Romania / northern Bulgaria (see Figure 4.2). Other clusters of high risk are the Po-area in northern Italy, the regions along the Rhine from south-western Germany to the North Sea, and the regions adjacent to the Elbe and/or Oder in the Czech Republic, Poland and north-eastern Germany. Also, the Alpine Regions (e.g. in Austria) are at high risk. Whereas the overall spatial distribution of flood risk remains more or less the same over the different climate scenarios (2011-2040 and 2041-2070), a generally slight increase in flood risk is seen for many regions (see Figure 4.2b-c). This trend is also reflected in the map presenting the changes from the baseline to Scenario 1 (Figure 4.2d), showing a patchy pattern of slight increases (deteriorations) in flood risk. If any geographical pattern can be identified, a major part of the regions with increasing risk is located in western Europe (Belgium, the Netherlands, Ireland and the UK).

The analysis of flood risk versus adaptive capacity reveals in total 20 hotspot regions of particular vulnerability for the baseline period (see Figure 4.2a, Table 4.6). Four of the five Hungarian regions show values exceeding the EU-mean and these are markedly higher than those of the other hotspot regions (see Table 4.6), thus indicating a particularly high risk. Of the 20 hotspot regions, eight are currently provided with an EU financial aid for climate change and risk prevention lower then the 0.8 percentile of all European regions (which is 23€ per capita). If adaptive capacity would remain the same for 2011-2040 than 22 regions would be hotspot regions while for the 2041-2070 period the number would be reduced to again 20

[1] The LISFLOOD model does not include Cyprus nor takes into account smaller island areas (only cells with an upstream area > 250 km^2 are modelled). Therefore, for the following five NUTS-2 regions no data for FE_AREA and FE_DPTH were available: CY00 (Cyprus), FI20 (Åland), GR22 (Ionia Nisia), GR41 (Voreio Aigaio), and GR42 (Notio Aigaio).

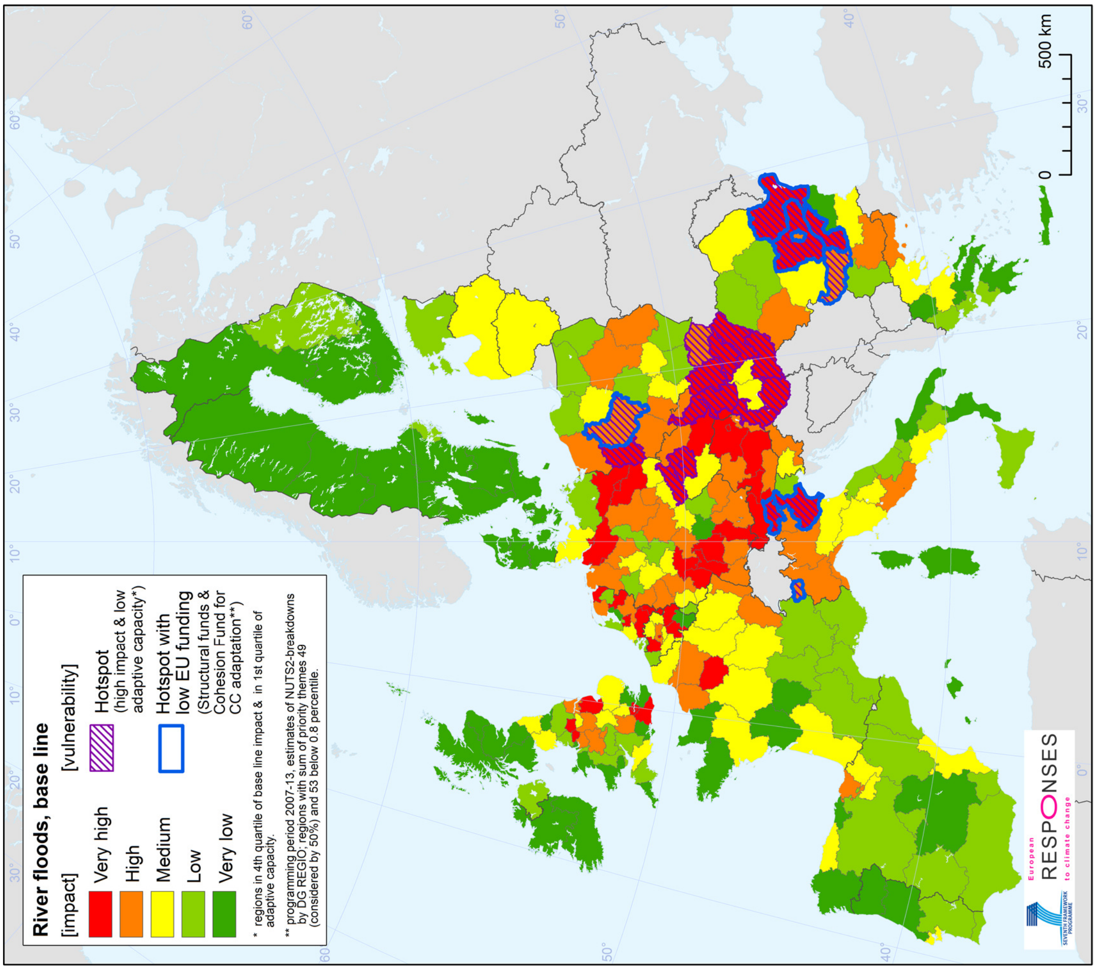

Figure 4.2(a): Map of river flood risk together with vulnerability hotspots, at NUTS-2 administrative level for EU27, baseline period.

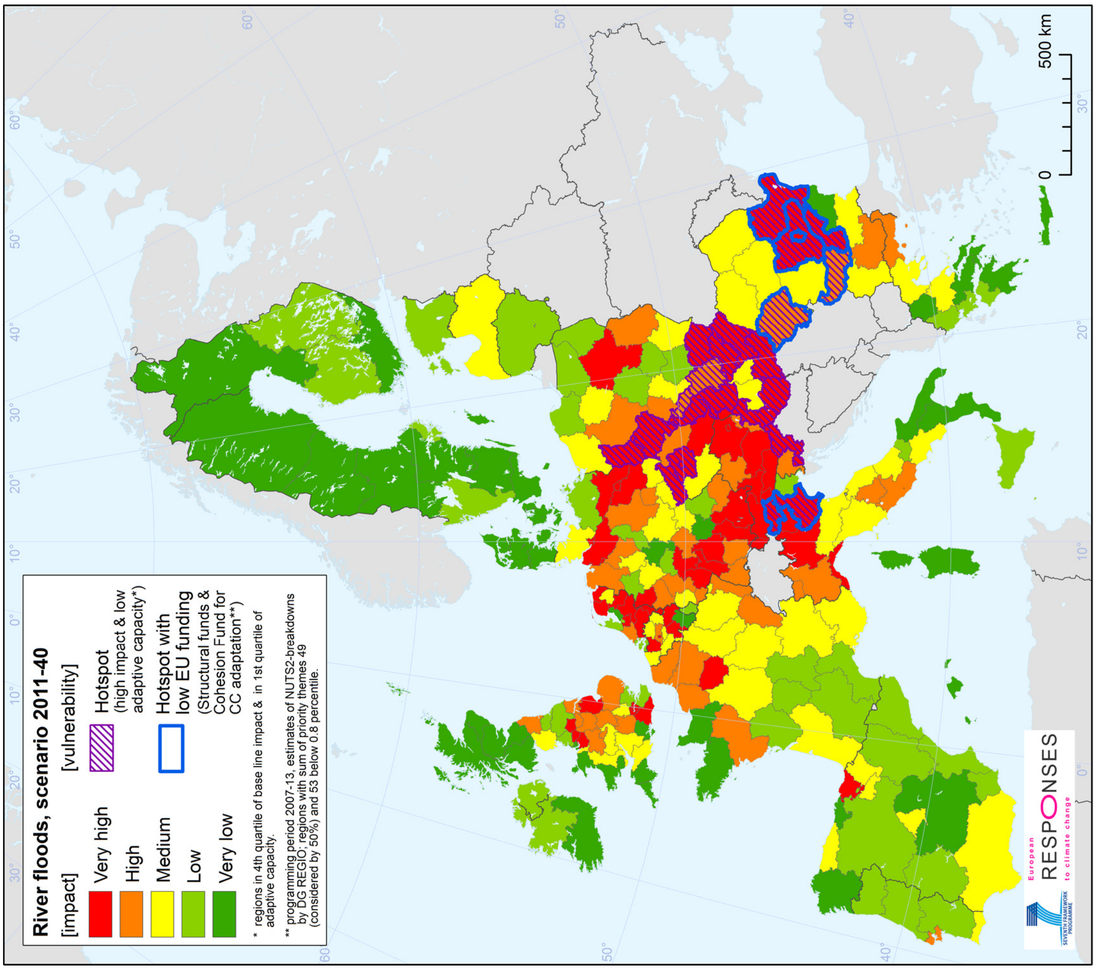

Figure 4.2(b): Map of river flood impact together with vulnerability hotspots, at NUTS-2 administrative level for EU27, scenario period 2011-2040.

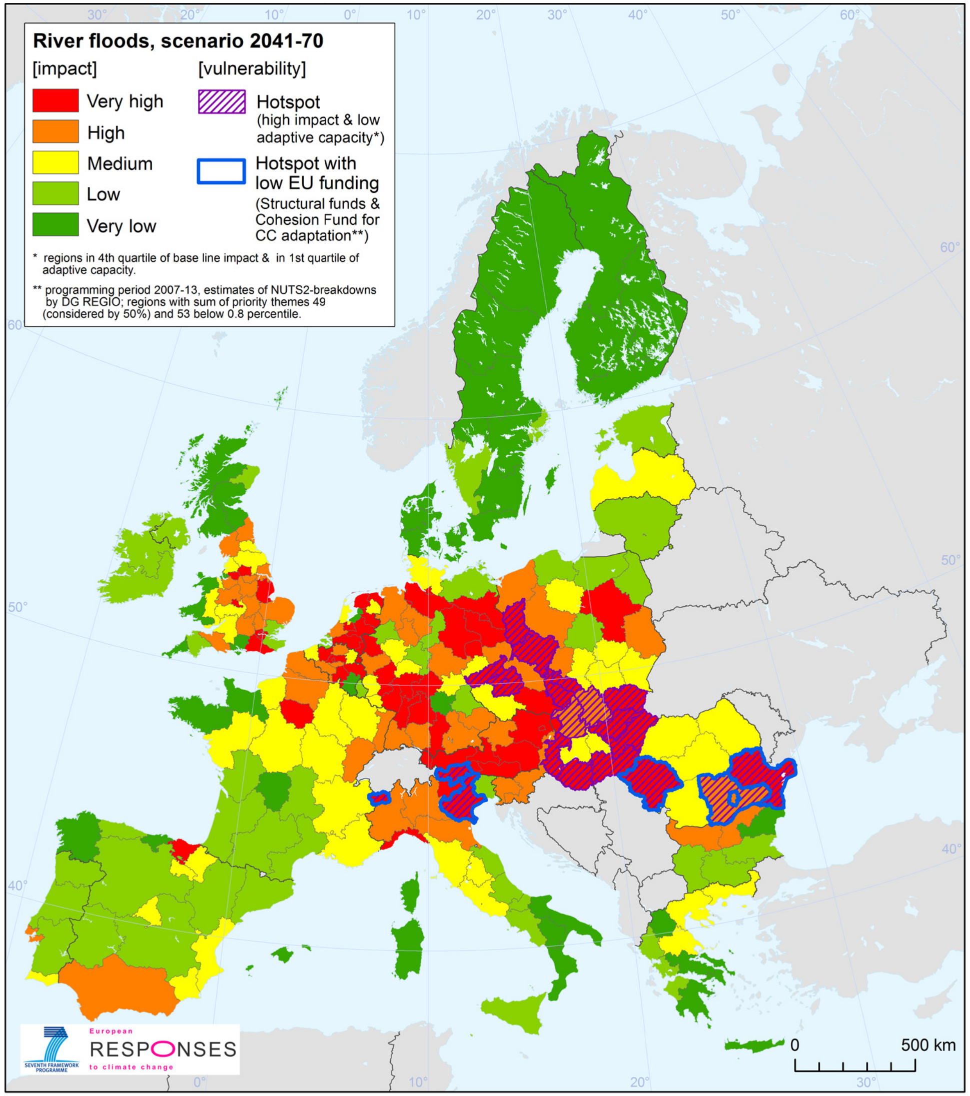

Figure 4.2(c): Map of river flood impact together with vulnerability hotspots, at NUTS-2 administrative level for EU27, scenario period 2041-2070.

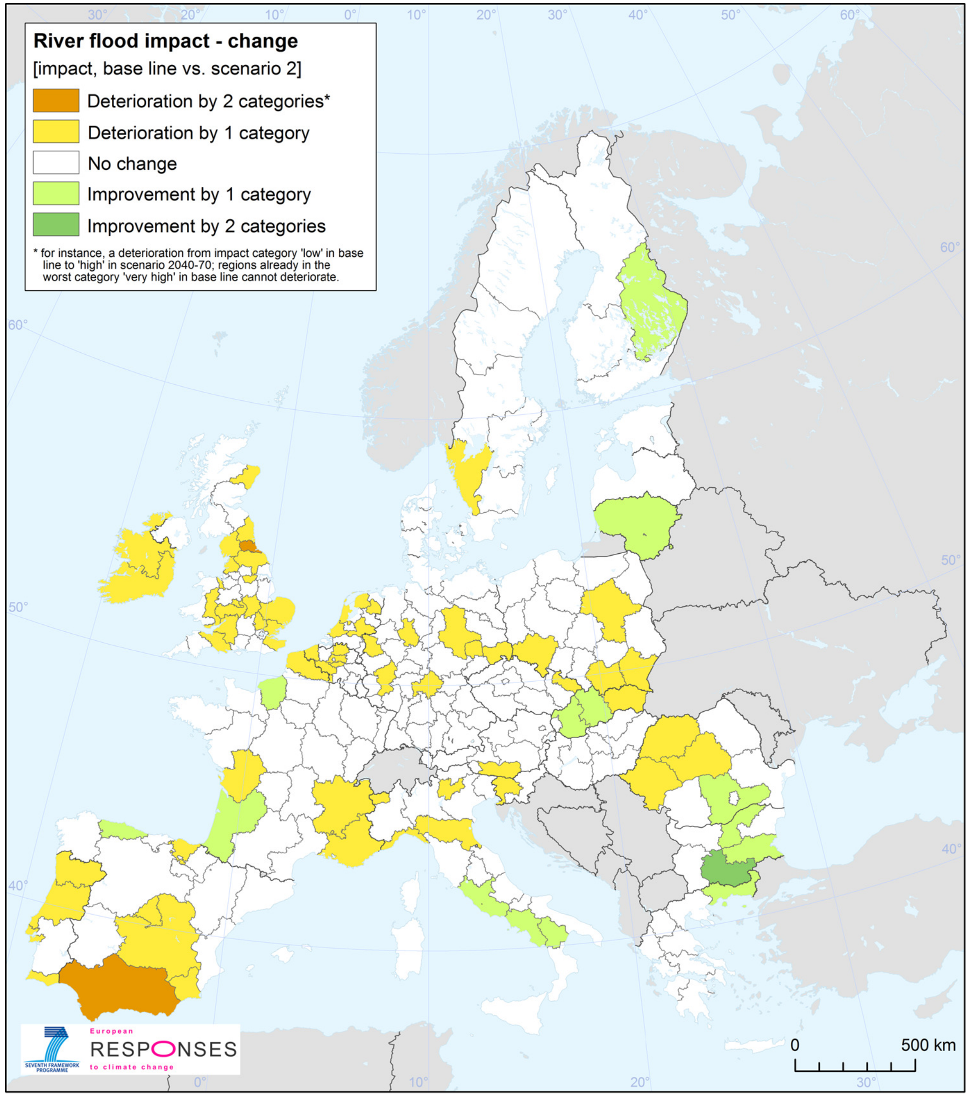

Figure 4.2(d): Map of projected change in river flood risk, from baseline to scenario 2041-2070, at NUTS-2 administrative level for EU27.

regions. In total 16 regions in Eastern Europe are projected to be hotspots for all three periods, most of them found in Czech Republic, Hungary, Slovakia and Romania.

Table 4.6: Potential flood vulnerability – hotspot NUTS-2 regions for baseline period as well as scenario periods 1 (2011-2040) and 2 (2041-2070) (✓= region is a hotspot, 'no' = region is not a hotspot; in parentheses the distance to the baseline EU-mean flood impact in percentage).

ID	NUTS-2 name	Baseline	Scenario 1	Scenario 2
BG31	Severozapaden	✓ (+4.2)	✓ (+4.0)	no (+3.3)
BG32	Severen tsentralen	✓ (+6.6)	✓ (+4.8)	no (+3.3)
CZ02	Strední Cechy	✓ (+5.3)	✓ (+5.4)	✓ (+7.2)
CZ04	Severozápad	✓ (+4.5)	✓ (+4.6)	✓ (+7.7)
CZ07	Strední Morava	✓ (+6.0)	✓ (+5.9)	✓ (+5.9)
CZ08	Moravskoslezsko	no (+3.4)	✓ (+4.3)	✓ (+5.0)
HU22	Nyugat-Dunántúl	✓ (+18.3)	✓ (+18.1)	✓ (+16.9)
HU23	Dél-Dunántúl	✓ (+6.3)	✓ (+5.8)	✓ (+5.7)
HU31	Észak-Magyarország	✓ (+17.4)	✓ (+17.5)	✓ (+17.1)
HU32	Észak-Alföld	✓ (+16.2)	✓ (+15.7)	✓ (+14.6)
HU33	Dél-Alföld	✓ (+13.9)	✓ (+14.5)	✓ (+13.3)
ITC2	Valle d'Aosta/Vallée d'Aoste	✓ (+4.1)	no (+2.9)	✓ (+4.6)
ITD1	Provincia Autonoma Bolzano	✓ (+9.3)	✓ (+10.5)	✓ (+11.8)
ITD3	Veneto	✓ (+5.2)	✓ (+7.9)	✓ (+8.1)
PL41	Wielkopolskie	✓ (+4.4)	no (+2.1)	no (+2.1)
PL43	Lubuskie	✓ (+9.1)	✓ (+7.3)	✓ (+6.8)
PL51	Dolnoslaskie	no (+3.5)	✓ (+6.7)	✓ (+7.6)
RO22	Sud-Est	✓ (+10.2)	✓ (+10.4)	✓ (+10.6)
RO31	Sud – Muntenia	✓ (+4.9)	✓ (+6.3)	✓ (+3.8)
RO42	Vest	no (+3.4)	✓ (+4.0)	✓ (+4.5)
SI01	Vzhodna Slovenija	no (+1.3)	✓ (+4.8)	no (+3.0)
SK02	Západné Slovensko	✓ (+7.2)	✓ (+4.6)	✓ (+4.2)
SK03	Stredné Slovensko	✓ (+4.4)	✓ (+4.2)	✓ (+4.1)
SK04	Východné Slovensko	✓ (+4.2)	✓ (+5.2)	✓ (+5.6)
total number of hotspot regions:		20	22	20

4.2.3. Discussion

The results indicate a trend towards a moderately increased risk of flood damages from extreme events for most regions in Europe in the coming decades, which is in line with previous pan-European flood studies taking into consideration climate change (Dankers and Feyen, 2008; Dankers and Feyen, 2009), as well as regional studies in individual countries and river basins (e.g. Bastola et al., 2011). Furthermore, the findings are in line with those of Ciscar et al. (2010) who project increasing flood damages particularly in large parts of western and central Europe as well as in the UK. A spatial pattern not apparent from the above mentioned studies but clearly visible here is a particularly high flood risk in highly urbanised NUTS-2 regions. Though less evident as for heat impact, urban regions stand out in terms of potentially affected population/residential areas, as well as the amount of industrial and commercial assets which are the main drivers for high flood impacts. Likewise, high risk for most of the Alpine and Slovakian regions is driven by high rates of potentially affected people and commercial or industrial infrastructure. An explanation for this phenomenon is the limited availability of space suitable for urban development due to steep slopes. In combination with other studies that project high risks for flooding in mountainous areas due to climate change (e.g. Allamano et al., 2009), the results thus underpin the necessity for strengthening flood protection measures in these areas.

An interpretation of the temporal evolvement of flood impact should take into account that disaggregated population density has been available only for the baseline period (i.e. it has been used as a static parameter) and that commercial and industrial areas are only projected to 2020. Therefore, changes in the indicator over time are mainly due to projected changes of extreme flood events and not due to changes in population and assets at risk (or only to a limited extent in case of commercial/industrial areas). Since the likelihood of no land use conversions to urban use (i.e. residential and or commercial/industrial) in flood-prone areas is rather low, it implies that the current results are likely to rather underestimate the actual projected flood risk. An update of the flood impact indicator for the two scenario periods with land use change projections and population density projections to at least 2050 could therefore refine the results.

While droughts and heat are spatially continuous hazards, floods are more localised phenomena. This spatial discontinuity makes floods slightly less suited for the NUTS-2 level study. While Dankers and Feyen (2008) depict the 100-year return level of river discharge along the major European rivers in a spatially explicit manner, here this information is aggregated at NUTS-2 level. In particular for large NUTS-2 regions this aggregation might lead to slightly misleading results. For instance, DE93 (Lüneburg) in northern Germany shows a very high risk for all three time periods (cp. Figures 4.2a-c) whereas in reality very high risk might only be found in its southern and northern parts along the major rivers Weser and Elbe. On the other hand it can be argued that an administrative aggregation such as NUTS-2 is the only appropriate way to (a) ensure full comparability with the other hazard-specific indicators, (b) explore the relationship between flood risk and adaptive capacity at pan-European scale, and (c) make comparisons with EU-funding schemes from the Structural funds and the Cohesion Fund.

4.3. Drought proneness

4.3.1. Selection of input variables and indicator construction

For assessing the proneness of European regions to droughts, four climate exposure parameters were chosen) that measure different aspects of the occurrence of precipitation deficits (Table 4.5). The maximum number of consecutive dry days (CDDs) was computed following the definition of the CCl/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI, http://www.clivar.org/organization/etccdi/etccdi.php) which defines a daily precipitation amount of less than 1.0 mm as a dry day. This definition has also been applied in other European drought studies (e.g. Nastos and Zeferos, 2009). Moreover, to capture water availability during the growing season, the total amount of precipitation from March to August was taken as a proxy. The general 'dryness' of the climate was accounted for by a third parameter, the aridity index after Budyko (1974). The index is the ratio of potential evapotranspiration (ET_0) to precipitation and in essence it provides a measure of the long-term water balance (Arora, 2002; Dankers and Hiederer, 2008). Potential evapotranspiration represents the evapotranspiration from a hypothetical reference vegetation with abundant water availability, thus removing the differentiation of the surface (i.e. crop type) from the calculation (Allen et al., 1998). For this study, ET_0 was calculated using the equation by Hargreaves et al. (1985), that involves radiation and temperature parameters.

Apart from the occurrence of precipitation deficits, the degree of sensitivity to agricultural droughts was assessed using three additional parameters (see Table 4.7). The percentage of agricultural area determines how much of each NUTS-2 land area could potentially be impacted. As stated in Chapter 2, this study does not consider human interference with the water balance such as irrigation. Consequently, the following CORINE land cover classes have been grouped to form 'agricultural area': non-irrigated arable land (code 211), vineyards (221), fruit trees and berry plantations (222), olive groves (223), annual crops associated with permanent crops (241), complex cultivation patterns (242), and agro-forestry areas (244). For the baseline period, agricultural land was calculated from CORINE 2006, whereas for the two scenario periods we used the 1x1km version of the land use model EU-ClueScanner (Perez-Soba et al., 2010). The model uses the multi-sectoral models IMAGE and GTAP (Eickhout et al., 2007) to define demands for land area, while the land allocation procedure is based upon the Dyna-CLUE model (Verburg and Overmars, 2009). For this study we employed the results of a model run to the year 2050, based on the SRES B1 socioeconomic scenario (Lavalle et al., 2011b).

Furthermore, based on the well-known rationale that higher agricultural dependency increases socio-economic susceptibility to droughts (Acosta-Michlik et al., 2008), data on the percentage of people employed in the primary sector was used. Finally, the influence of soil properties on drought severity is addressed by taking into account soil water holding capacity, which has been successfully used in previous regional-scale European drought impact assessments (e.g. Hlavinka et al., 2009). For this study we use the pan-European dataset on topsoil available water capacity, with a spatial resolution of 1 x 1 km, from the Pedotransfer Rules Database (PTRDB) of the European Soil Database (ESDB) (Panagos, 2006). Since it only provides interval scaled data (three classes for the EU27 area, 100-140 mm/m, 140-190 mm/m and > 190 mm/m) the mean of each class is used for the calculations. In case of the open ended class '> 190 mm/m', half of the interval of the second highest class was added to the lower class boundary (i.e. 190 + 25 = 215). These values where then assigned to each respective pixel and used to derive the mean per NUTS-2 region.

Table 4.7: Input parameters for drought proneness indicator, their temporal coverage, and data sources (DE = drought exposure input, DS = drought sensitivity input).

Name	Description	Temporal coverage Baseline	 Scenario1	 Scenario2	Data source
DE_CDDMAX	Maximum number of consecutive days per year with daily precipitation < 1 mm	1961-90	2011-40	2041-70	ENSAMBLES-project, 5 RCMs[1]
DE_PRECgr	Growing season precipitation (March to August)	1981-10	2011-40	2041-70	ENSAMBLES-project, 5 RCMs[1]
DE_ARID	Aridity Index (ratio of precipitation to potential evaporation) , annual mean	1961-90	2011-40	2041-70	ENSAMBLES-project, 5 RCMs[1]
DS_AGRI	Percentage of agricultural area (CLC classes 211, 221, 222, 223, 241, 242 and 244)	2006	2030	2050	CORINE land cover (2006); EU-CLUE Scanner, 1x1km version (2030, 2050)
DS_EMPL	Percentage of employment in primary sector	2009	---	---	EUROSTAT
DS_SOIL	Topsoil available water capacity	2001	---	---	European Soil Database (ESDB)

[1] for details see Table 2.1

As percentage of employment (DS_EMPL) and water holding capacity (DS_SOIL) are only available for the baseline period, they were treated as constants for the two scenario periods. For in total 15 NUTS-2 regions the values for DS_SOIL were deemed unreliable outliers and thus they were replaced with values from neighbouring regions or the national average (for a detailed list of regions affected see Appendix A). While the three sensitivity parameters do not show correlations above 0.5, this is the case for the three climate exposure parameters (see Table 4.8). Therefore, their average should be calculated and used as single exposure input parameter for data aggregation. This would, however, lead to an imbalance between the exposure, now only consisting of one combined parameter, and the three sensitivity parameters, if applying equal weighing. Therefore, to reflect the strong dependency of agriculture on weather conditions, all three parameters were retained in the data aggregation procedure, thus maintaining the weather impact in the drought indicator.

Table 4.8: Correlation matrix for drought exposure (DE) and drought sensitivity (DS) parameters.

	DE_CDDMAX	DE_PRECgr	DE_ARID		DS_AGRI	DS_EMPL	DS_SOIL
DE_CDDMAX	1.00			DS_AGRI	1.00		
DE_PRECgr	**0.63**	1.00		DS_EMPL	0.07	1.00	
DE_ARID	**0.54**	**0.82**	1.00	DS_SOIL	-0.13	0.03	1.00

Note: n=261, Pearson’s correlation coefficient, correlations > 0.5 in bold

4.3.2. Results

The spatial pattern throughout Europe reveals that most of the Mediterranean regions, stretching from the Iberian Peninsula to Greece and Cyprus, are highly prone to agricultural droughts (red or orange colours in Figure 4.3a). In Spain and Italy, only the northern regions are not falling into one of the two highest impact categories. Moreover, most regions of Bulgaria, Romania, the southern part of Hungary, as well as the majority of the Polish regions reveal high or very high drought proneness. Additionally, some high-impact regions are found in north eastern Germany, Denmark, Lithuania and Latvia, the eastern UK, and in France. In contrast, the northern and western part of the UK, Ireland, and the Alpine area reveal only low or very low drought proneness. Similarly, most parts of Belgium and The Netherlands, of western-central and southern Germany as well as of Sweden and Finland show low or very low drought proneness. For some countries a clear within-country gradient of drought proneness is seen. For instance, in Germany a gradient can be seen from a highly prone north east to a very low prone south west. Regarding the temporal evolvement from the baseline to the scenario period 2041-2070, the results reveal a slight deterioration particularly in Bulgaria, northern Italy, northern Spain, and France while a slight improvement can be seen for some NUTS-2 regions in south-eastern Germany, Czech Republic, and Sweden (see Figure 4.3b-c). This is also reflected by the long-term change map (Figure 4.3d) which shows changes at maximum by one category, with deteriorations particularly in the northern half of the Mediterranean, in France and in Bulgaria, and improvements in central and northern Europe. However, the majority of regions remain in the same impact category for all three time periods.

The overlay of proneness to agricultural droughts with NUTS-2 adaptive capacity reveals a total number of 43 regions as hotpot regions with high vulnerability. These regions are mainly found in Portugal, southern

Italy, Greece, Bulgaria, Romania, and in Poland (see Figure 4.3a-c). To a large extent the hotspot regions coincide with the overall spatial distribution of high drought impact regions throughout Europe. Since impact does not change largely over time so does the number of hotspot regions, revealing 44 regions for both periods 2011-2040 and 2041-2070 (see Table 4.9). Regions with a particular high impact in the baseline period (i.e. more than 10% above the EU-mean impact) are found in Spain (ES43), Greece (GR11, GR22, GR23, GR24, GR25, GR41), Italy (ITF4, ITG1), Poland (PL34, PL41), and Portugal (PT16, PT18). In total 23 of the 43 hotspot regions of the baseline period are currently provided with EU funding for climate change adaptation and risk prevention measures that is lower than the 0.8 percentile of all European regions (23€ per capita). Most of these regions are in Bulgaria, Romania and Poland while some are also found in southern Italy.

Table 4.9: Potential drought vulnerability – hotspot NUTS-2 regions for baseline period as well as scenario periods 1 (2011-2040) and 2 (2041-2070) (✓ = region is a hotspot, 'no' = region is not a hotspot; in parentheses the distance to the baseline EU-mean drought proneness in percentage).

ID	NUTS-2 name	Baseline	Scenario 1	Scenario 2
BG31	Severozapaden	no (+2.5)	no (+3.9)	✓ (+4.5)
BG32	Severen tsentralen	no (+3.8)	✓ (+4.8)	✓ (+5.7)
BG33	Severoiztochen	✓ (+6.0)	✓ (+7.3)	✓ (+8.1)
BG34	Yugoiztochen	✓ (+4.3)	✓ (+5.6)	✓ (+6.6)
BG42	Yuzhen tsentralen	no (+3.2)	✓ (+4.3)	✓ (+5.7)
CZ02	Strední Cechy	✓ (+4.1)	no (+3.2)	no (+3.2)
ES43	Extremadura	✓ (+14.6)	✓ (+16.0)	✓ (+16.8)
GR11	Anatoliki Makedonia, Thraki	✓ (+11.4)	✓ (+12.4)	✓ (+13.8)
GR13	Dytiki Makedonia	✓ (+9.5)	✓ (+10.2)	✓ (+11.1)
GR22	Ionia Nisia	✓ (+10.7)	✓ (+10.8)	✓ (+12.0)
GR23	Dytiki Ellada	✓ (+11.3)	✓ (+11.7)	✓ (+12.8)
GR24	Sterea Ellada	✓ (+12.2)	✓ (+12.6)	✓ (+13.6)
GR25	Peloponnisos	✓ (+12.8)	✓ (+13.4)	✓ (+14.8)
GR41	Voreio Aigaio	✓ (+11.1)	✓ (+11.4)	✓ (+12.6)
GR42	Notio Aigaio	✓ (+8.8)	✓ (+9.3)	✓ (+10.5)
HU32	Észak-Alföld	✓ (+6.0)	✓ (+6.4)	✓ (+6.7)
HU33	Dél-Alföld	✓ (+6.0)	✓ (+6.3)	✓ (+7.0)
ITF2	Molise	✓ (+6.2)	✓ (+5.7)	✓ (+5.0)
ITF3	Campania	✓ (+6.2)	✓ (+6.2)	✓ (+6.2)
ITF4	Puglia	✓ (+12.1)	✓ (+13.0)	✓ (+13.5)
ITF5	Basilicata	✓ (+6.0)	✓ (+5.7)	✓ (+6.0)
ITF6	Calabria	✓ (+9.6)	✓ (+9.7)	✓ (+10.3)
ITG1	Sicilia	✓ (+11.0)	✓ (+11.4)	✓ (+11.8)
ITG2	Sardegna	✓ (+9.6)	✓ (+9.4)	✓ (+10.4)
PL11	Lódzkie	✓ (+9.1)	✓ (+9.3)	✓ (+8.9)
PL31	Lubelskie	✓ (+8.1)	✓ (+8.0)	✓ (+7.6)
PL32	Podkarpackie	✓ (+4.7)	✓ (+4.3)	no (+3.6)
PL33	Swietokrzyskie	✓ (+7.0)	✓ (+6.8)	✓ (+6.4)
PL34	Podlaskie	✓ (+10.4)	✓ (+9.9)	✓ (+9.3)
PL41	Wielkopolskie	✓ (+10.6)	✓ (+10.3)	✓ (+10.0)
PL42	Zachodniopomorskie	✓ (+5.6)	✓ (+4.8)	✓ (+4.1)
PL43	Lubuskie	✓ (+5.3)	✓ (+5.2)	✓ (+5.1)
PL52	Opolskie	✓ (+5.2)	✓ (+5.2)	✓ (+5.0)
PL61	Kujawsko-Pomorskie	✓ (+9.7)	✓ (+9.4)	✓ (+8.9)
PL62	Warminsko-Mazurskie	✓ (+7.1)	✓ (+6.4)	✓ (+5.7)
PL63	Pomorskie	✓ (+4.4)	no (+3.4)	no (+2.7)
PT11	Norte	no (+3.3)	✓ (+4.5)	✓ (+5.6)
PT15	Algarve	✓ (+9.7)	✓ (+11.4)	✓ (+12.7)
PT16	Centro (PT)	✓ (+10.8)	✓ (+12.4)	✓ (+13.4)
PT18	Alentejo	✓ (+15.6)	✓ (+17.3)	✓ (+18.7)
RO11	Nord-Vest	✓ (+5.5)	✓ (+5.5)	✓ (+5.7)
RO12	Centru	✓ (+4.5)	✓ (+4.8)	✓ (+5.1)
RO21	Nord-Est	✓ (+5.5)	✓ (+6.2)	✓ (+6.4)
RO22	Sud-Est	✓ (+8.3)	✓ (+9.4)	✓ (+9.9)
RO31	Sud - Muntenia	✓ (+8.1)	✓ (+9.1)	✓ (+10.0)
RO41	Sud-Vest Oltenia	✓ (+6.9)	✓ (+8.3)	✓ (+9.3)
RO42	Vest	✓ (+4.6)	✓ (+5.1)	✓ (+5.9)
	total number of hotspot regions:	43	44	44

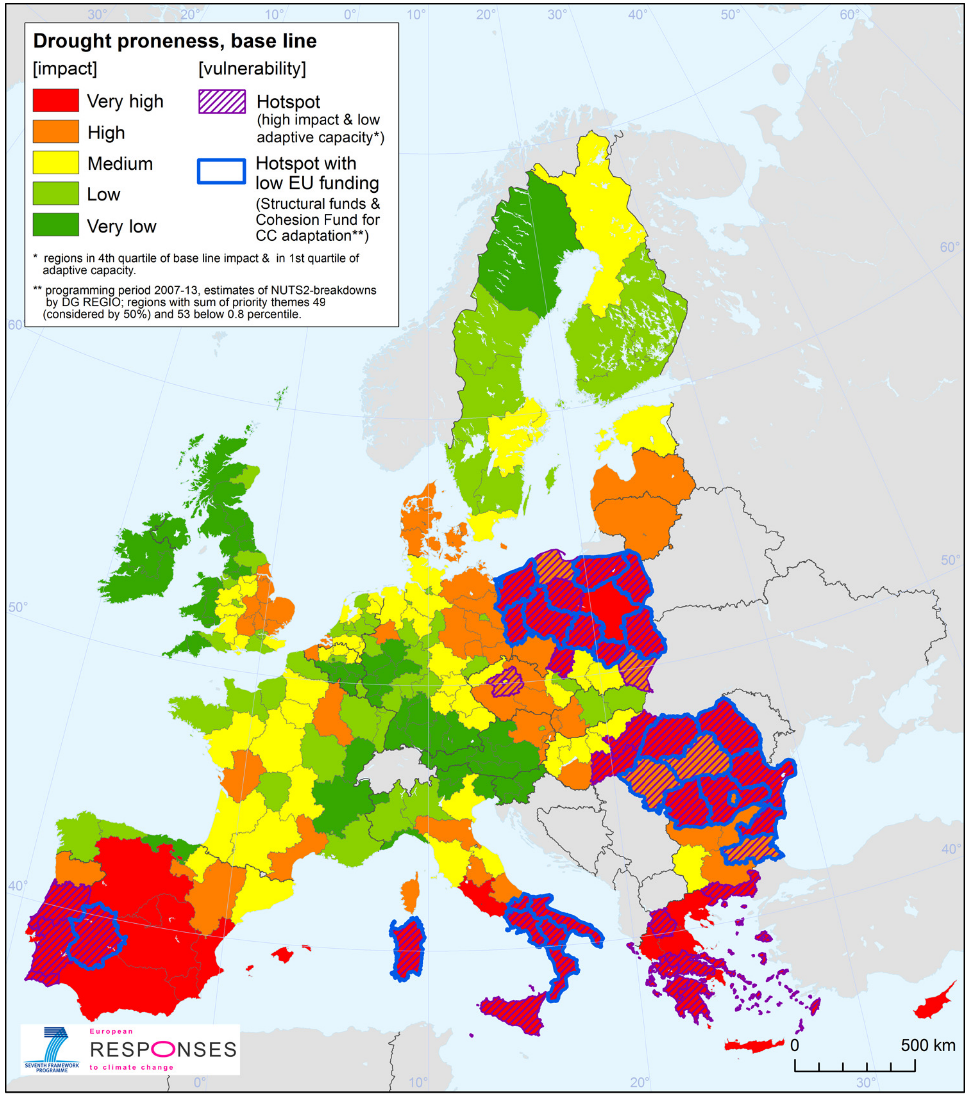

Figure 4.3(a): Map of drought proneness together with vulnerability hotspots, at NUTS-2 administrative level for EU27, baseline period.

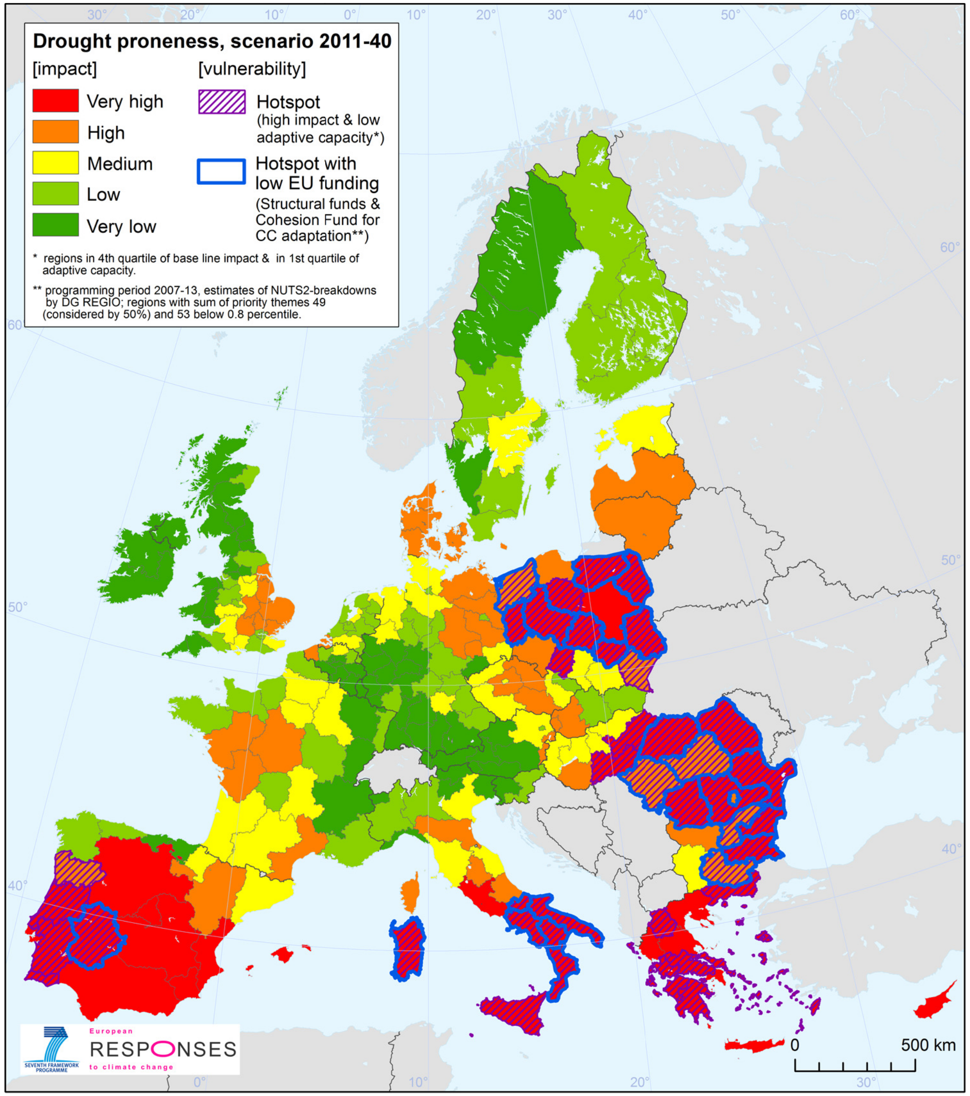

Figure 4.3(b): Map of drought proneness together with vulnerability hotspots, at NUTS-2 administrative level for EU27, scenario period 2011-2040.

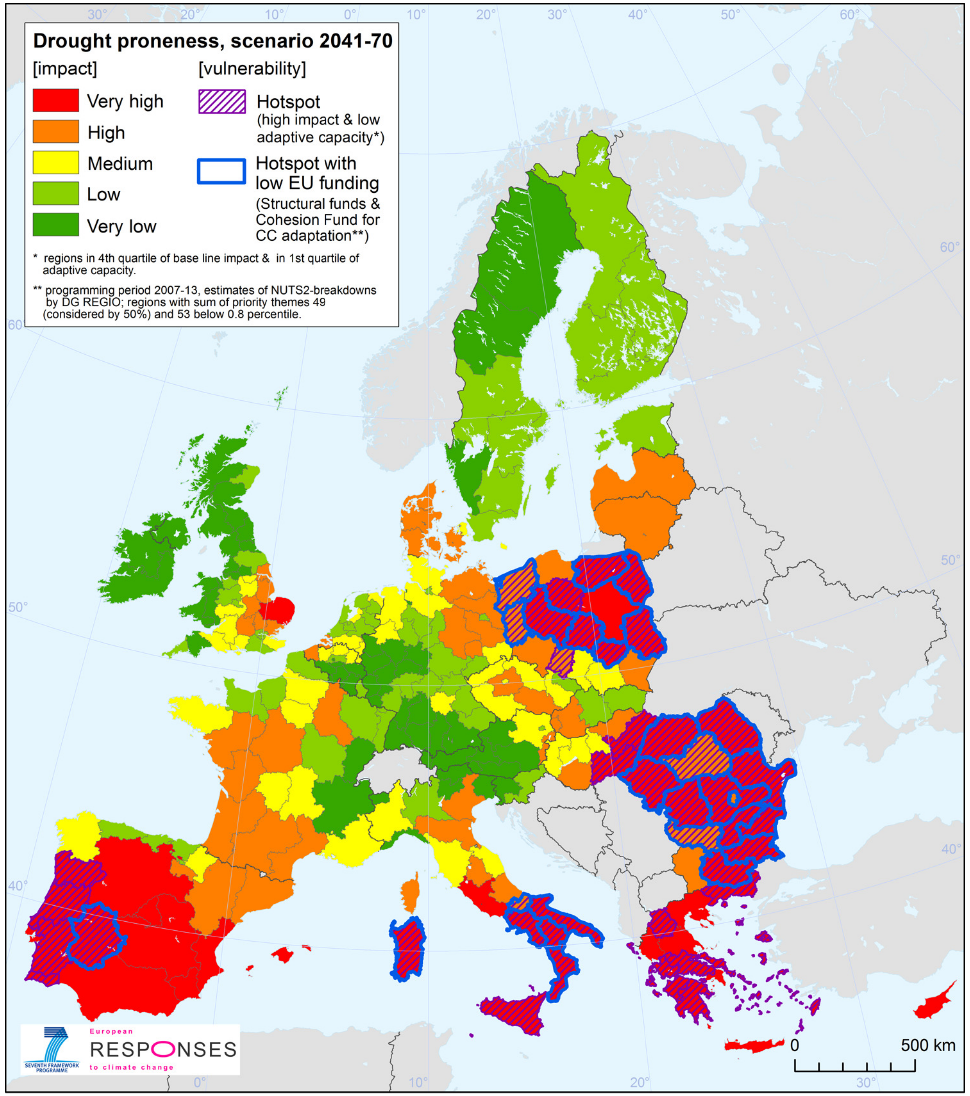

Figure 4.3(c): Map of drought proneness together with vulnerability hotspots, at NUTS-2 administrative level for EU27, scenario period 2041-2070.

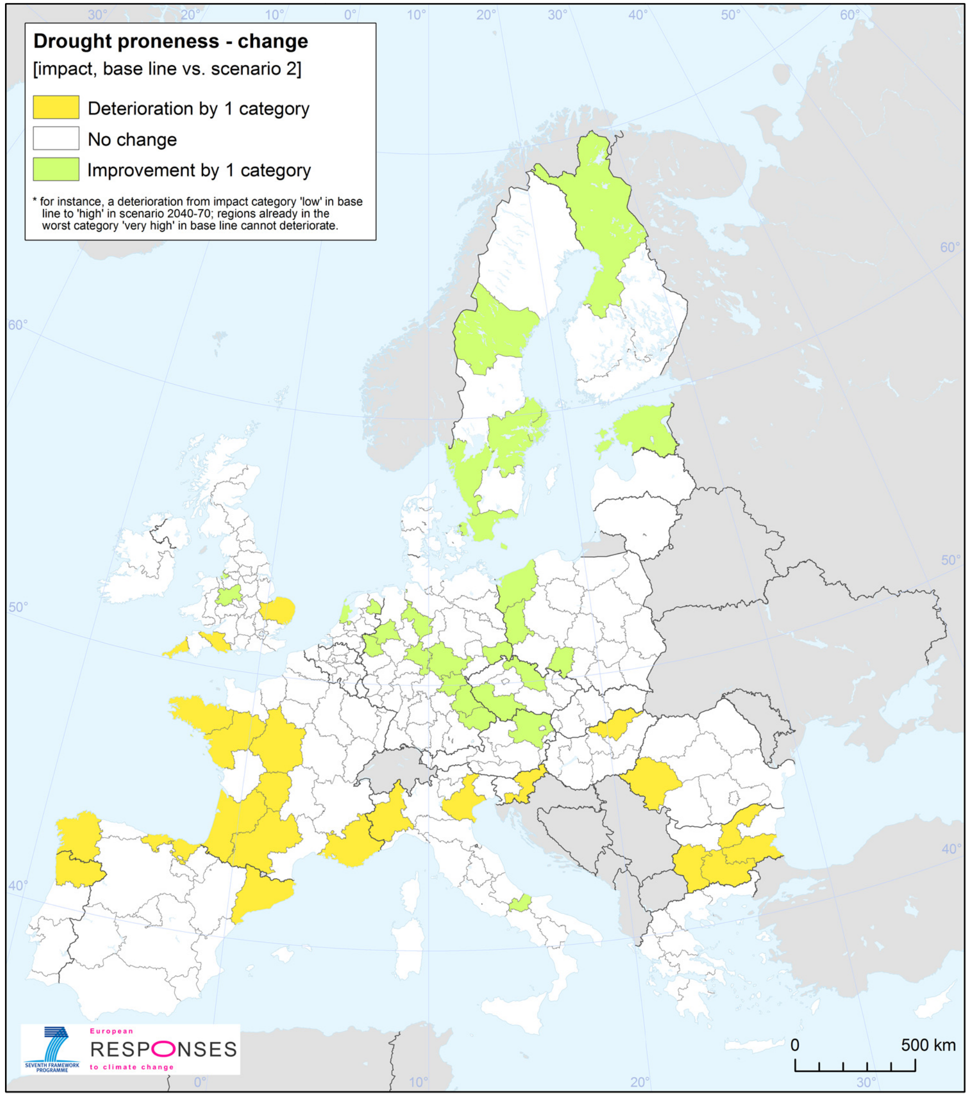

Figure 4.3(d): Map of projected change in drought proneness, from baseline to scenario 2041-2070, at NUTS-2 administrative level for EU27.

4.3.3. Discussion

A recent study on agro-climatic conditions in Europe under climate change found that particularly the Mediterranean is expected to face an increased agricultural drought proneness and, as a consequence, increasing crop yield variability (Trnka et al., 2011). Moreover, the authors emphasised that south-eastern Europe as well as western France are also at high risk of a reduced suitability for rain-fed agriculture. These findings are generally confirmed by the spatial pattern of the baseline drought proneness (cp. Figure 4.3a), and, to some extent, also reflected by the temporal evolvement of the indicator. However, the results show only slight increases in drought proneness (e.g. in France and Bulgaria) while for many regions in southern Europe no changes are revealed (cp. Figure 4.3d). These patterns can be explained by two factors: (a) limitations inherent to the comparison of categories (from very high to very low), and (b) effects of the different input parameters. The grouping of the original indicator (see Appendix B, Table 3) into categories inevitably hides increases for regions that are classified into the highest category already for the baseline assessment. For drought proneness this is the case for many southern European regions. An additional comparison of changes in relative distance to the baseline EU-average between the baseline and Scenario 2 (2041-2070) shows that indeed an increase in drought proneness is projected for most southern European regions, in particular for Portugal, northern and western Spain, South France, Bulgaria and southern Romania, most Greek regions, and Cyprus (see Figure 4.4).

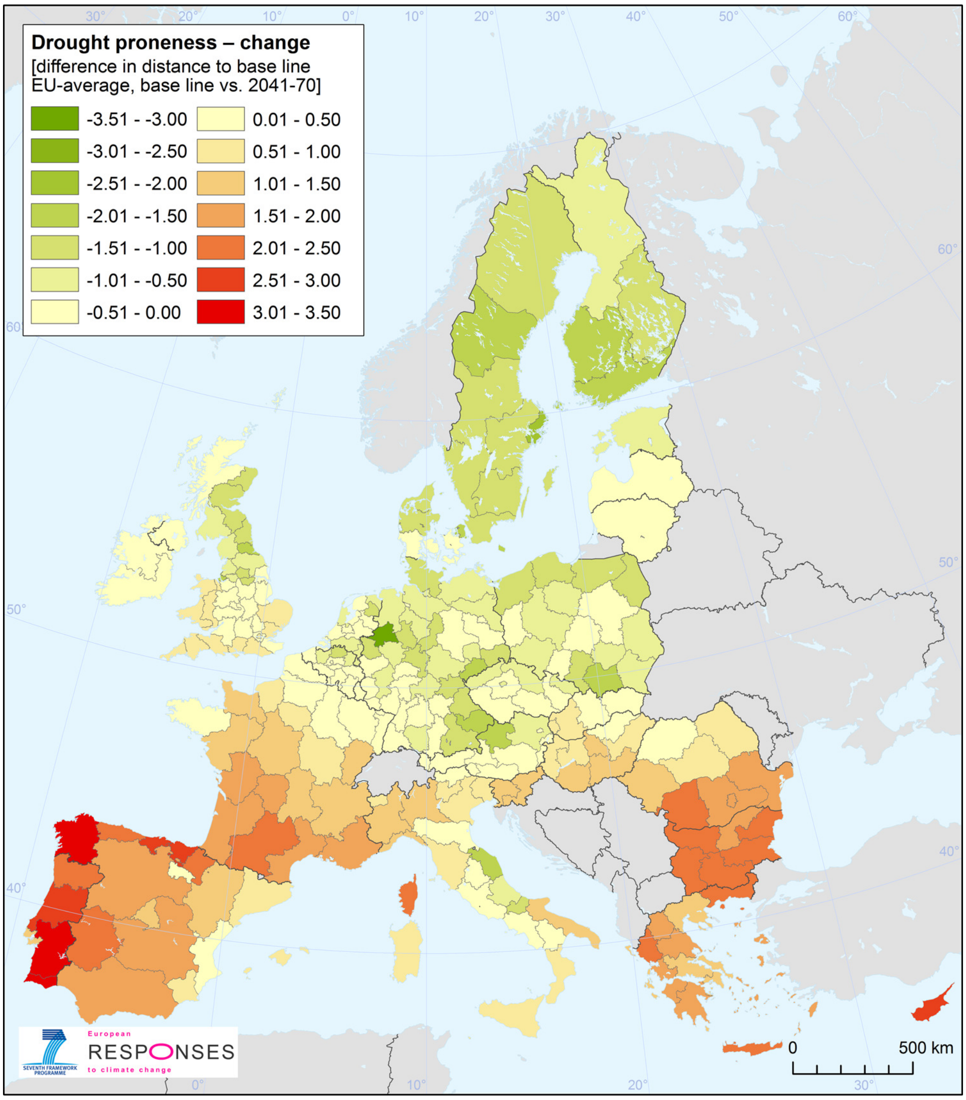

Figure 4.4: Map of changes in drought proneness. Taking the EU baseline average as reference, the change [in %] is calculated from the difference in distance of baseline values vs. 2041-2070 values (e.g. a NUTS-2 region X with distance to baseline average of -1.2% for baseline and of 2.1% for scenario 2041-2070 would show an increase of 3.3%).

A decomposition of the drought indicator sheds light on the influence of the different input parameters. An analysis of their evolvement over the three time periods reveals the existence of two opposing trends. Whereas the climate impact parameters for in particular the southern European regions clearly show a trend towards increased dry spells and reduced precipitation, for most of European regions the agricultural area is predicted to decrease. Consequently, the dynamics of climate exposure and those of agricultural land use have a counteracting effect. Hence, decreasing importance of agriculture disguises an increased exposure to climatic extremes, thus leading to relatively low net change rates of the drought proneness indicator. Still, it would be wrong to conclude from this study that agricultural land in southern Europe will not face an increased drought exposure. Instead, the indicator has to be interpreted as an overall measure of (NUTS-2) region drought proneness taking into account projected developments of land use and climate change.

A plot of projected changes in agricultural land for the years 2000 vs. 2050 compared to the mean change of the three climate exposure parameters 1961-90 vs. 2041-70 illustrates this phenomenon (see Figure 4.5, each dot represents a NUTS-2 region). It shows that most regions are placed in the fourth quadrant, i.e. they show an increasing climate exposure but a decreasing agricultural area. In total, 172 of the 261 regions reveal such a compensating effect (second and fourth quadrants) while only 22 regions show an increase of both components (first, red quadrant in Figure 4.5). Many of those red quadrant regions fall into the highest class already for the baseline, i.e. they are not depicted in the change map comparing categories (cp. Figure 4.3d). In contrast, quite a number of in total 65 regions with decreases in both components (third, green quadrant in Figure 4.5) show an overall reduction of drought proneness by one category (cp. Figure 4.3d). These are mainly found in central Europe and Scandinavia and reflect the influence of projected increases in spring precipitation for these regions (cp. Dankers & Hiederer, 2008), as part of the growing season precipitation parameter.

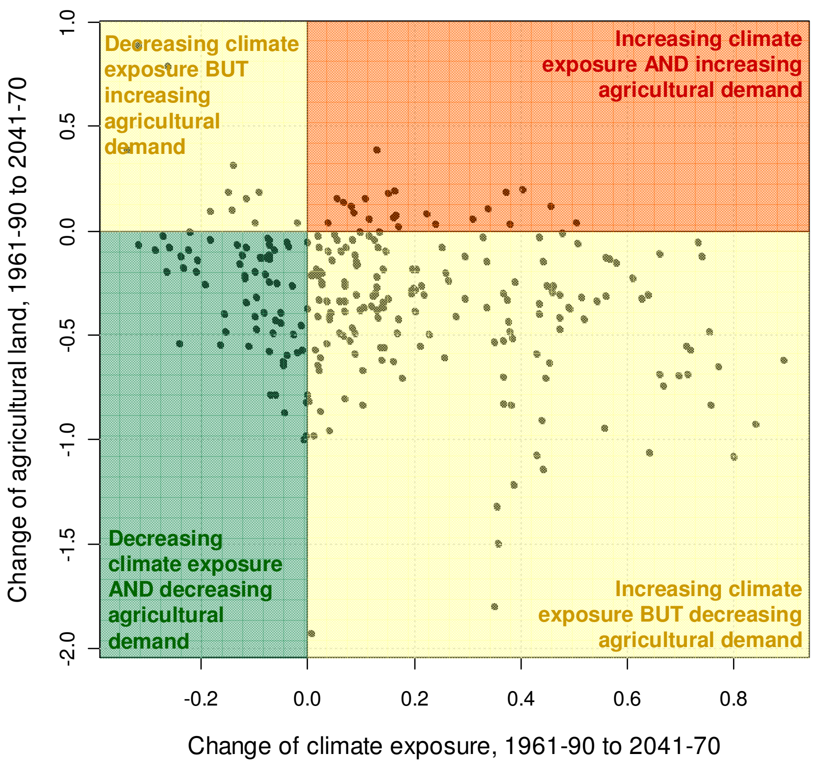

Figure 4.5: Plot of changes in drought exposure parameters (DE_CDDMAX, DE_PRECgr, DE_ARID) vs. changes in agricultural land (DS_AGRI), baseline to scenario 2041-2070.

Even though climate exposure is only moderate, for Poland, Lithuania, and Latvia a high percentage of agriculturally used land together with a very high employment rate in agriculture leads to high drought proneness. A similar effect, more precisely a high percentage of agriculture together with low soil water holding capacity, explains high drought proneness values for north-eastern Germany, Denmark and the south-eastern parts of England. While the Polish case is considered an important pointer to the country's socio-economic drought susceptibility (i.e. dependency on agriculture, cp. Acosta-Michlik et al., 2008), the high values in particular for Denmark are questionable. For the Danish regions a replacement of the current soil water holding capacity values with country-specific high-resolution data might potentially improve the indicator. Similarly, for a few regions in central Italy and for DEA3 (Münster), the projected decreases in agricultural land are believed to be too high, thus leading to a decrease of the drought proneness indicator from 1961-1990 to 2041-2070 that is assumed to be too strong (see Figure 4.4).

4.4. Forest fires

4.4.1. Input variables and indicator construction

Indices on forest fire danger can be broadly grouped into (1) long-term fire probability indices, with variables that have a slow rate of change over time (e.g. accessibility, slope), (2) short-term or dynamic indices, focussing on the likelihood of fire ignition and spread (e.g. based on daily weather conditions), and (3) combined indices, that take into account both short-term and long-term parameters (San-Miguel-Ayanz et al., 2003). In the framework of this study we aim at constructing a combined fire danger index that takes into account climate parameters from the same ENSEMBLES climate models that are used for assessing the other three hazards. A variety of meteorological forest fire risk indices have been developed, of which the Canadian Fire Weather Index (FWI) (van Wagner, 1987) relies on a range of relevant parameters, and has been shown to perform well. The index is based on daily data, using temperature, precipitation, relative humidity, and wind speed as main input. Several studies show that it is well correlated with observed fire occurrences in the Mediterranean (e.g. Aguado et al., 2003) and it has been used for assessing changes in fire risk based on data from regional climate models (Moriondo et al., 2006). However, its computation for 30-year periods is very time-consuming and results from the JRC processing of the ENSEMBLES climate data to this goal are only expected towards the end of 2011 (personal communication with A. Camia, JRC). Therefore, as preliminary proxies for the FWI for this study we used the three parameters consecutive dry days (FFE_CDDMAX, same parameter also used for the drought index), mean daily summer temperature (FFE_T2MEAN), and summer precipitation (FFE_PRECsu) (see Table 4.10).

Apart from climatic exposure, each region has a specific sensitivity that determines the occurrence and the severity of fire behaviour. Land use and fuel characteristics are factors that describe this sensitivity. As a general proxy for fuel availability and for the value of forest with all its functions and services, forest area might be used as an easily quantifiable variable (Schelhaas et al., 2010). In order to capture natural vegetation in a broader sense we used the parameter 'wildland', defined as the CORINE classes broad-leaved forest (CLC code 311), coniferous forest (312), mixed forest (313), natural grasslands (321), sclerophyllous vegetation (323), and transitional woodland-shrub (324). For the time horizons 2030 and 2050, land-use projections from the EU-ClueScanner modelling framework were used (see Table 4.10). Moreover, fire spread heavily depends on fuel characteristics such as horizontal distribution, density or live/dead ratio, which have been taken into account in the parameter 'fuel type combustibility', developed within the FUELMAP project (Sebastián-López et al., 2010), launched by JRC to develop a fuel map of Europe based on a novel fuel classification system. For three fuel types with missing data (coniferous plantations, broadleaved plantations, mixed plantations) combustibility was calculated as the simple mean of the other coniferous, broadleaved and mixed forest fuel type classes, respectively. Subsequently, we calculated the mean combustibility per NUTS-2 region. We would like to point out that, according to the FUELMAP project documentation, the quantification of fuel type combustibility is currently at a preliminary state based on expert opinion and might be revised in the future.

In addition, several studies have highlighted the importance of considering the impact of human activities, as human-induced fires are known to be commonplace in particular in the Mediterranean (Padilla and Vega-García, 2011). To capture this aspect, distance to roads or settlements are well-established proxies in spatially explicit models (Martínez et al., 2009). Here, we used the road network of the TeleAltas MultiNet package, Version 3.4.2.1, functional road classes 1 (Motorways), 2 (Major roads of high importance), 3 (Other major roads), 4 (Secondary roads), 5 (Local connecting roads), and 6 (Local roads of high importance) (TeleAtlas, 2007). Unfortunately, for Bulgaria TeleAtlas provides only road class 1 data (i.e. motorways). Since no other adequate dataset for Bulgaria comparable to the TeleAtlas data is known to the authors, we used the mean wildland distance to roads of the eight Romanian NUTS-2 regions for the six

Bulgarian regions, simply assuming a similar road infrastructure in those two countries. Both for fuel type combustibility and for wildland accessibility we assumed a static situation over time due to the lack of projected data.

Table 4.10: Input parameters for forest fire danger indicator, their temporal coverage, and data sources (FFE = forest fire exposure input, FFS = forest fire sensitivity input).

Name	Description	Temporal coverage			Data source
		Baseline	Scenario1	Scenario2	
FFE_CDDMAX	Greatest number of consecutive days per year with daily precipitation < 1 mm	1961-90	2011-40	2041-70	ENSAMBLES-project, 5 RCMs[1]
FFE_T2MEAN	Mean of daily mean summer temperature (June, July, August)	1961-90	2011-40	2041-70	ENSAMBLES-project, 5 RCMs[1]
FFE_PRECsu	Summer precipitation (June, July, August)	1961-90	2011-40	2041-70	ENSAMBLES-project, 5 RCMs[1]
FFS_WILDL	Percentage of wildland (CLC classes 311, 312, 313, 321, 323, 324)	2000	2030	2050	CORINE land cover (2000); EU-CLUE Scanner, 1x1 km version (2030, 2050)
FFS_COMBU	Mean fuel type combustibility	2000	---	---	FUELMAP project (Sebastián-López, 2010)
FFS_ACCESS	Wildland accessibility by roads (functional road classes 1 to 6)	2007	---	---	Tele Atlas MultiNet, version 2008.01

[1] for details see Table 2.1

Indicator construction followed the statistical methodology described in section 2.2 apart from the following exceptions and particularities. The three weather exposure parameters show bivariate correlations above 0.5 and hence, their average should be used as input for data aggregation. However, in order to account for the high dependence of forest fires on weather conditions (Schelhaas et al., 2010) the three parameters we kept separately in the data aggregation procedure, thus increasing the weather impact on the fire danger indicator. In addition, an exception to the rule of equal weighting of all parameters was introduced for Sweden and Finland, whose regions have an exceptionally high share of wildland area but climate exposure values below EU average. Therefore, the wildland parameter had to be adjusted in order to prevent an unrealistically strong impact. In an iterative process we finally decided to reduce the weight by 50% (i.e. to 1/12, each of the six input parameters accounts for 1/6 in the equal weighting scheme) and to add that weight to the climate parameter FFE_T2MEAN (now accounting for 3/12 of the overall weight instead of 1/6). By doing so we attempt to incorporate into the indicator the fact that fire danger only increases if exceptionally high wildland and fuel load resources coincide with appropriate weather conditions.

Table 4.11: Correlation matrix for forest fire exposure (FFE) and forest fire sensitivity (FFS) parameters.

	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu		FFS_WILDL	FFS_COMBU	FFS_ACCESS
FFE_CDDMAX	1.00			FFS_WILDL	1.00		
FFE_T2MEAN	**0.83**	1.00		FFS_COMBU	0.19	1.00	
FFE_PRECsu	**0.76**	**0.73**	1.00	FFS_ACCESS	-0.40	-0.05	1.00

Note: n=261, Pearson's correlation coefficient, correlations > 0.5 in bold

4.4.2. Results

The results for the baseline period reveal a very high fire danger for virtually all NUTS-2 regions in the southern European countries of Portugal, Spain, Italy, Greece, and in parts of Bulgaria (see Figure 4.6a). Within France a gradient from very high fire danger for southern France to a medium danger in northern France is seen. Single, scattered areas of high danger are further found in central and eastern Europe, in particular in (south)-eastern Germany, Poland, Czech Republic, the lowland areas of Austria, and Hungary. In contrast, Ireland and the UK, the Alpine region, the Baltic States and most parts of Scandinavia show low or very low fire danger. Over time, an increase in fire danger for the period 2011-2040 is revealed in particular in major parts of France, Germany, Belgium, the southern Netherlands, southern Sweden and Finland, as well as for Romania and Bulgaria (see Figure 4.6b). For the period 2041-70 the northwards expansion of very high and high fire danger is confirmed (see Figure 4.6c). This trend is also reflected in the change map, revealing changes towards higher fire danger categories in France, northern Italy, Bulgaria and Romania, Germany, the Benelux countries and southern Scandinavia (see Figure 4.6d).

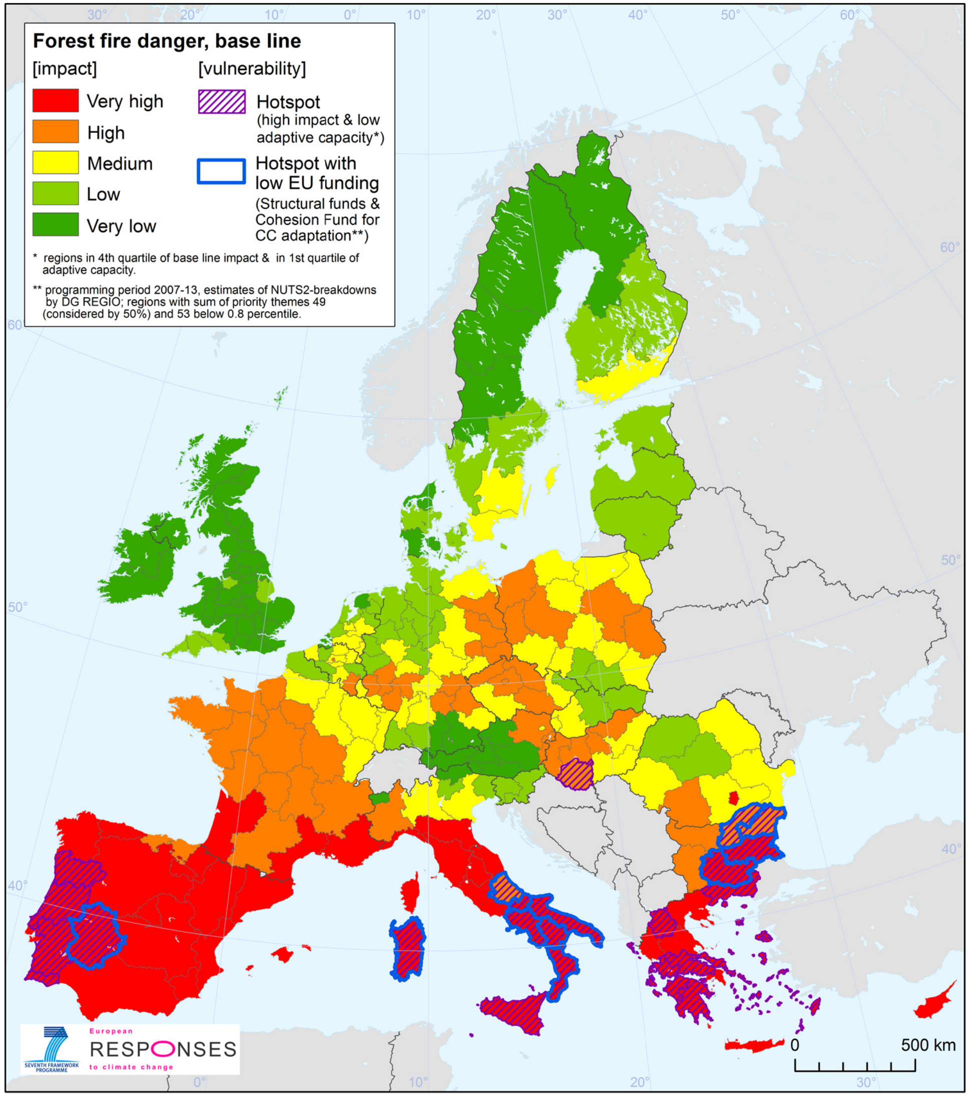

Figure 4.6(a): Map of forest fire danger together with vulnerability hotspots, at NUTS-2 administrative level for EU27, baseline period.

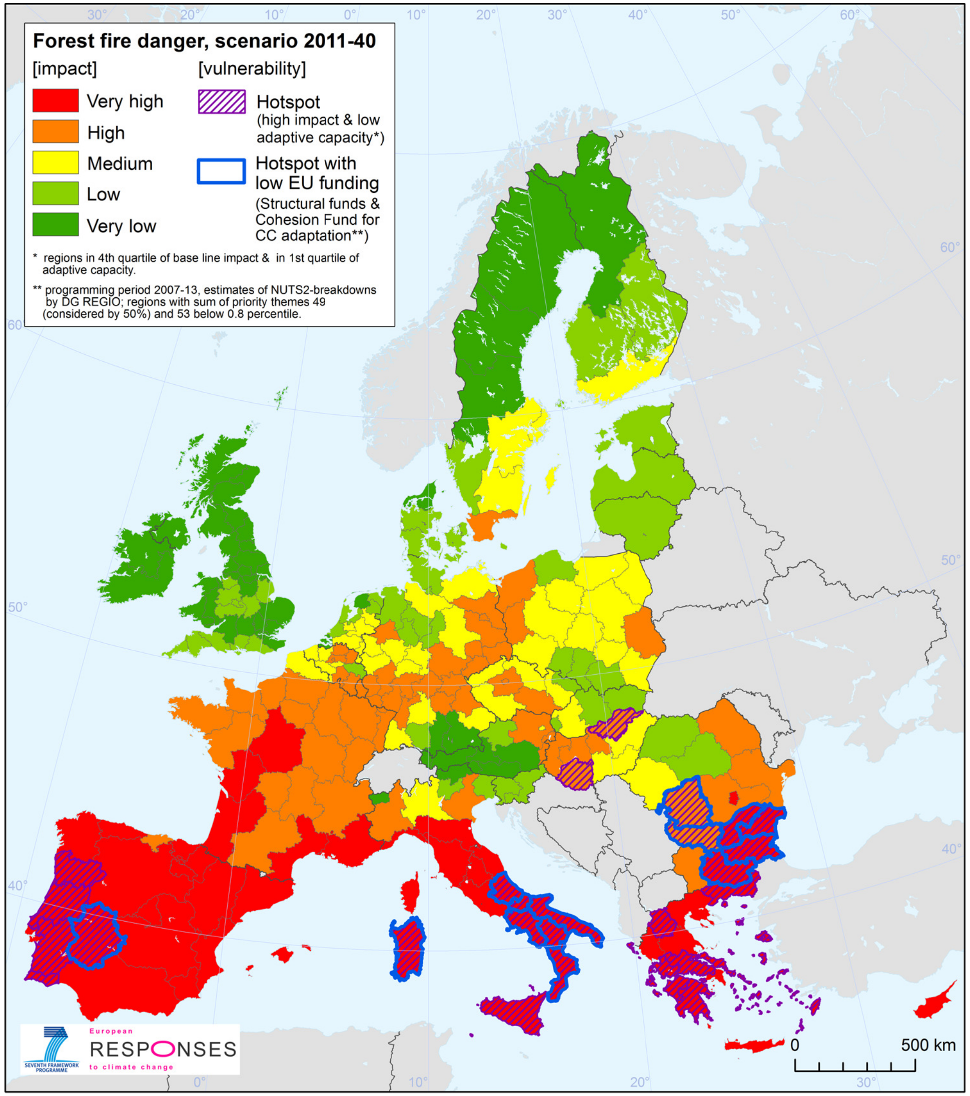

Figure 4.6(b): Map of forest fire danger together with vulnerability hotspots, at NUTS-2 administrative level for EU27, scenario period 2011-2040.

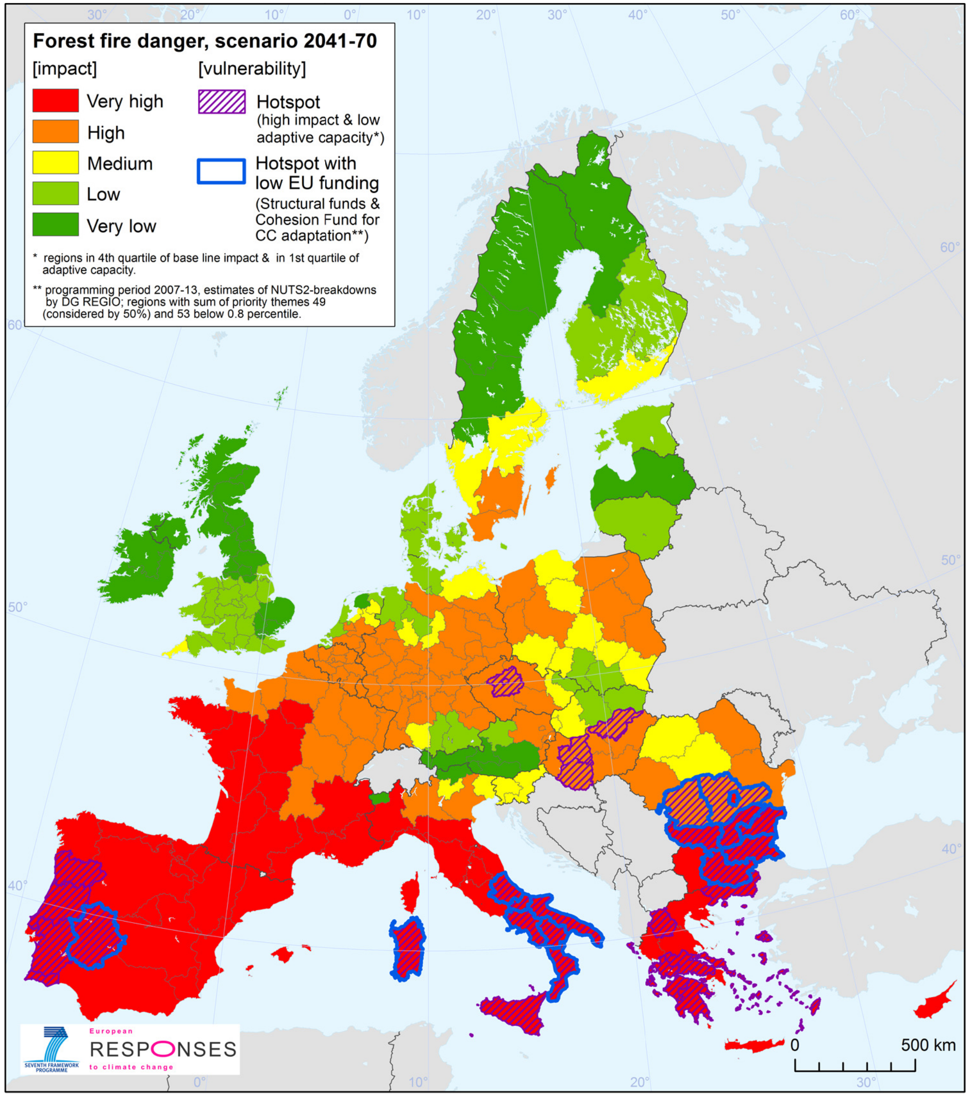

Figure 4.6(c): Map of forest fire danger together with vulnerability hotspots, at NUTS-2 administrative level for EU27, scenario period 2041-2070.

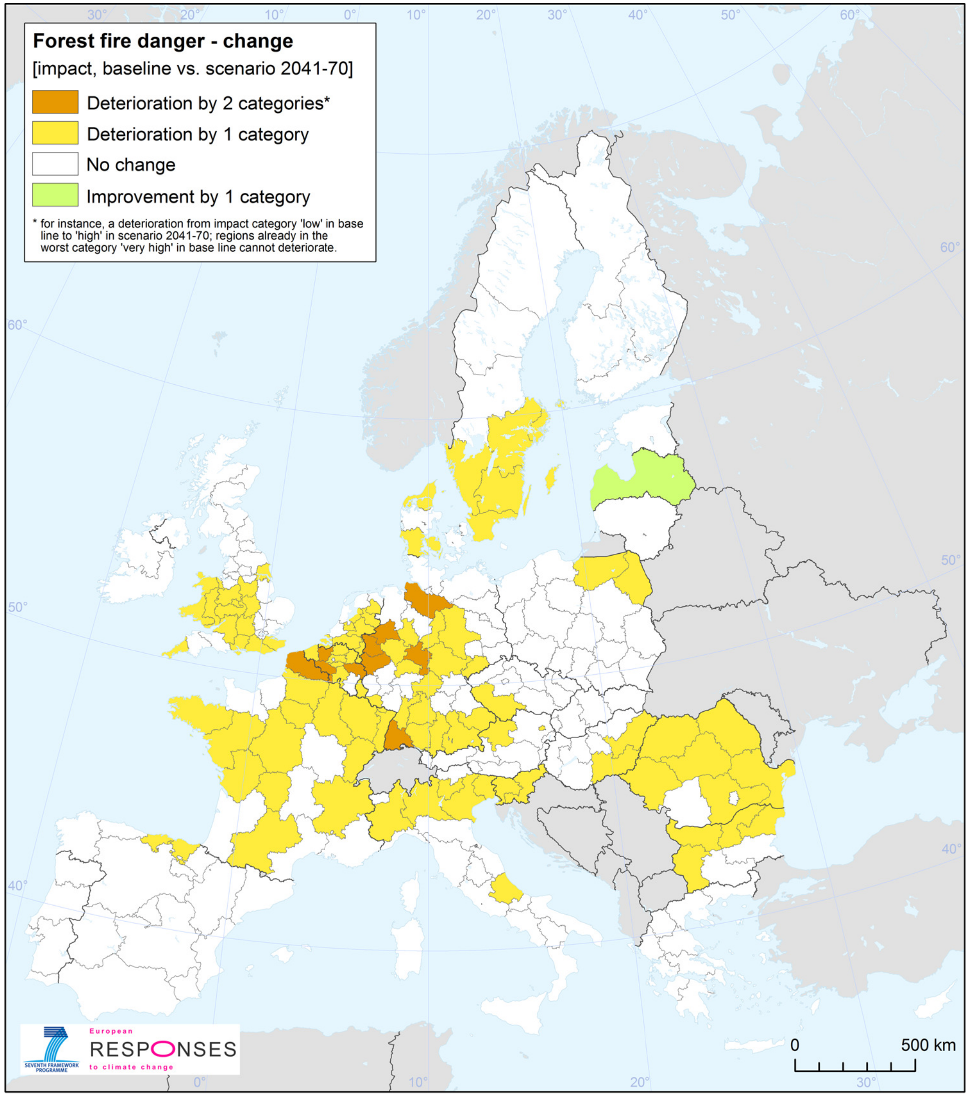

Figure 4.6(d): Map of projected change in forest fire danger, from baseline to scenario 2041-2070, at NUTS-2 administrative level for EU27.

The hotspot analysis for the baseline period reveals a total number of 26 hotspot regions where adaptive capacity is low and forest fire danger high (see Table 4.12). Most of these potentially highly vulnerable regions are found in Portugal, southern Italy, Greece and Bulgaria. Of those regions 12 currently receive EU aid from the Structural Funds dedicated to climate change adaptation and risk prevention below 23€ per capita. Contrasting current adaptive capacity with the potential changes in forest fire danger for the two scenario periods results in a moderate increase in the number of hotspot regions to 29 for 2011-2040 and 32 for 2011-2040 (see Table 4.12). Regions that would become new hotspot regions in the scenario periods are found in Bulgaria, Romania, Hungary and Czech Republic and are all located north of those of the baseline period, thus reflecting the northwards shift of fire danger (see Figure 4.6a-c). If the current EU funding policy would remain the same the number of regions with low funding would slightly increase from currently 12 to 15 in 2041-2070 (see Figure 4.6c). The distance to EU-mean fire danger of the hotspot regions in Table 4.12 further shows a continuous increase of danger for almost all regions, also for those that are in highest impact category, already from the baseline to the first scenario period of 2011-2040, such as the Portuguese, Italian and Greek regions. The regions from these countries also show the highest fire danger (i.e. they have the highest values above EU average) in all three periods.

Table 4.12: Potential forest fire vulnerability – hotspot NUTS-2 regions for baseline period as well as scenario periods 1 (2011-2040) and 2 (2041-2070) (✓= region is a hotspot, 'no' = region is not a hotspot; in parentheses the distance to the baseline EU-mean fire danger in percentage).

ID	NUTS-2 name	Baseline	Scenario 1	Scenario 2
BG31	Severozapaden	no (+1.8)	✓ (+3.3)	✓ (+5.0)
BG32	Severen tsentralen	✓ (+3.8)	✓ (+5.1)	✓ (+6.7)
BG33	Severoiztochen	✓ (+4.2)	✓ (+5.4)	✓ (+6.8)
BG34	Yugoiztochen	✓ (+5.5)	✓ (+7.0)	✓ (+8.8)
BG42	Yuzhen tsentralen	✓ (+5.0)	✓ (+6.6)	✓ (+8.9)
CZ02	Strední Cechy	no (+2.0)	no (+1.3)	✓ (+2.3)
ES43	Extremadura	✓ (+13.1)	✓ (+15.1)	✓ (+17.2)
GR11	Anatoliki Makedonia, Thraki	✓ (+10.5)	✓ (+12.3)	✓ (+14.6)
GR13	Dytiki Makedonia	✓ (+6.9)	✓ (+9.0)	✓ (+11.3)
GR22	Ionia Nisia	✓ (+14.3)	✓ (+16.9)	✓ (+19.3)
GR23	Dytiki Ellada	✓ (+12.1)	✓ (+14.1)	✓ (+16.3)
GR24	Sterea Ellada	✓ (+13.6)	✓ (+15.6)	✓ (+17.8)
GR25	Peloponnisos	✓ (+13.1)	✓ (+15.4)	✓ (+18.0)
GR41	Voreio Aigaio	✓ (+13.2)	✓ (+15.6)	✓ (+18.2)
GR42	Notio Aigaio	✓ (+12.8)	✓ (+14.9)	✓ (+16.9)
HU21	Közép-Dunántúl	no (+1.6)	no (1.6)	✓ (+2.7)
HU23	Dél-Dunántúl	✓ (+2.6)	✓ (+2.5)	✓ (+3.8)
HU31	Észak-Magyarország	no (+1.9)	✓ (+2.6)	✓ (+3.6)
ITF1	Abruzzo	✓ (+4.4)	✓ (+6.5)	✓ (+9.0)
ITF2	Molise	✓ (+9.2)	✓ (+11.1)	✓ (+14.1)
ITF3	Campania	✓ (+10.9)	✓ (+12.6)	✓ (+14.9)
ITF4	Puglia	✓ (+8.7)	✓ (+10.0)	✓ (+11.8)
ITF5	Basilicata	✓ (+10.4)	✓ (+12.5)	✓ (+15.1)
ITF6	Calabria	✓ (+13.3)	✓ (+15.5)	✓ (+18.0)
ITG1	Sicilia	✓ (+11.7)	✓ (+14.4)	✓ (+17.0)
ITG2	Sardegna	✓ (+12.8)	✓ (+14.0)	✓ (+16.4)
PT11	Norte	✓ (+9.0)	✓ (+12.1)	✓ (+14.3)
PT15	Algarve	✓ (+15.1)	✓ (+17.2)	✓ (+19.1)
PT16	Centro (PT)	✓ (+12.9)	✓ (+15.2)	✓ (+17.3)
PT18	Alentejo	✓ (+15.5)	✓ (+17.6)	✓ (+19.5)
RO31	Sud - Muntenia	no (0.0)	no (+1.0)	✓ (+2.4)
RO41	Sud-Vest Oltenia	no (+1.4)	✓ (+2.6)	✓ (+4.2)
	total number of hotspot regions:	26	29	32

4.4.3. Discussion

Constructing fire danger indices based on administrative units such as NUTS-2 regions is not commonplace. Usually, risk assessments are performed using fully grid-based bio-physical models, which allow location-specific parameters (e.g. topographic variables like aspect, San-Miguel-Ayanz et al., 2002) to be considered for which the calculation of a NUTS-mean is not meaningful. Therefore, the forest fire index of the present study is inevitably somehow simpler than other approaches (e.g. Schelhaas et al., 2010). However, a comparison with existing grid-based assessments at the European scale shows high correspondence. For instance, an overlay of the baseline period results with those of an assessment of long-term seasonal severity rating averages (SSR, a component of the Canadian FWI) 1958 to 2006 based on ERA-40 data (Camia et al., 2008) reveals a Pearson's correlation coefficient of 0.78 for the 261 NUTS-2 regions. Also in terms of temporal evolvement the results confirm the findings by Moriondo et al. (2006), who predict an increased fire risk in particular for France due to changing climatic conditions.

While for the drought indicator a counteracting effect was found between changes in climate exposure and land use changes (see section 4.3.3), here the two components are additive. Increasing dry spells and temperature combined with increasing areas of wildland leads to net increase in fire danger for most European regions. While this is not evident from comparing categories (cp. Figure 4.6d), analysing the changes in relative distance to the baseline EU-average clearly shows that the strongest increases are predicted to occur in Portugal (particularly in the north), in southern and western Spain, in southern and central Italy, as well as in Greece (see Figure 4.7). These regions coincide with the areas already facing the most severe forest fires, both in terms of number of fires and burnt area (JRC, 2010). Whereas in the Baltic States and parts of Poland fire danger is predicted to decrease due to increased spring and summer precipitations (cp. Dankers and Hiederer, 2008), the map confirms the shift of forest fire danger north-westwards into France and central Europe (e.g. Belgium, Germany). The results of this study thus underpin the urgency for strengthening fire-prevention and fire-fighting resources in the highly affected regions while it may help to identify those areas where significantly more resources might be needed in the future (e.g. in many French and German regions).

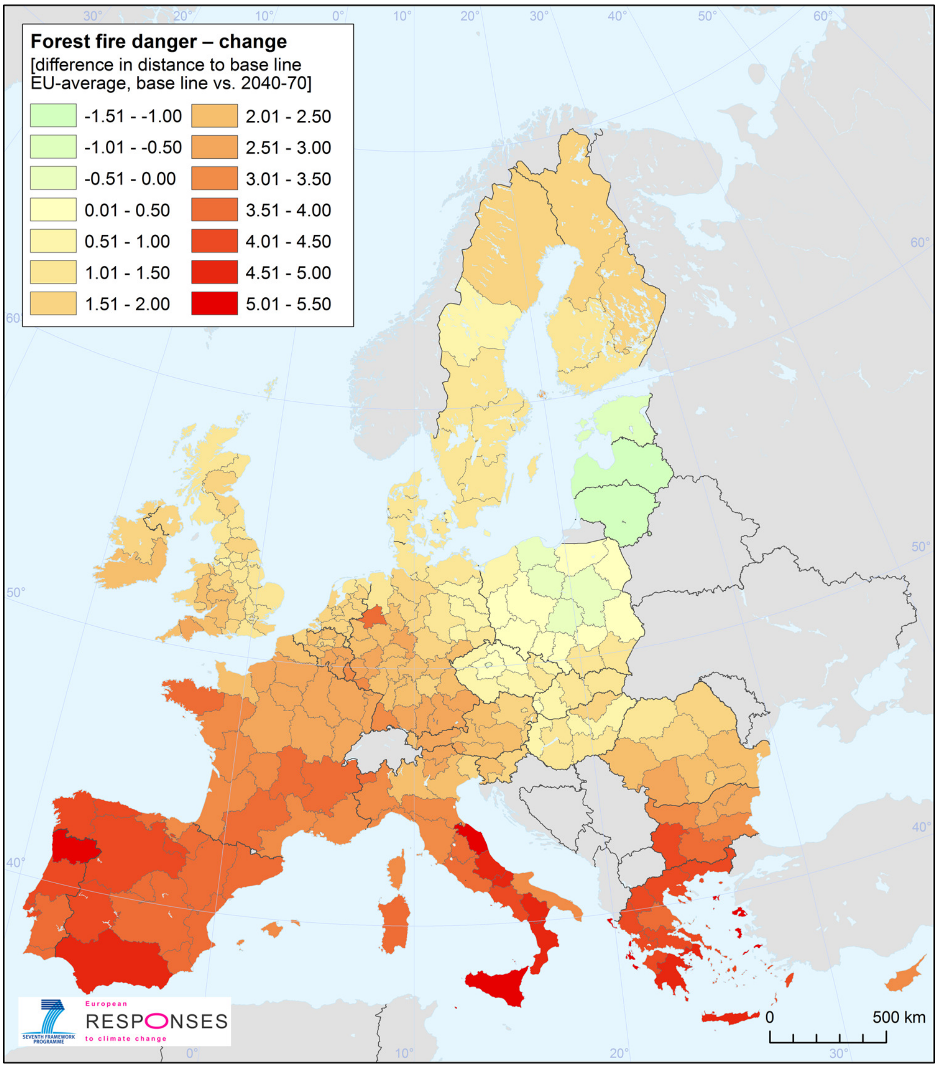

Figure 4.7: Map of changes in forest fire danger. Taking the EU baseline average as reference, the change [in %] is calculated from the difference in distance of baseline values vs. 2041-2070 values (e.g. a NUTS-2 region X with distance to baseline average of -3.2% for baseline and of 2.1% for scenario 2041-2070 would show an increase of 5.3%).

5. Overall hazard impact and vulnerability hotspots

5.1. Calculation of overall hazard impact

Overall hazard impact is computed from the impact indicators of the four hazards (heat stress, floods, droughts and forest fires). This part of the study aims at identifying multi-hazard hotspots, i.e. those regions that are (or are not) highly or very highly impacted by all or at least the majority of the four hazards. Only those 256 regions with results for all four hazards were considered, i.e. the five regions without results from the flood assessment were disregarded. Due to the presence of different ranges of variation, an assessment directly based on the four impact indicators would bias the results towards the hazard(s) with the highest range of variation. Instead, we based our analysis on the five impact categories 'very high', 'high', 'medium', 'low', and 'very low' already known from the hazard-specific analyses and defined the following four types of overall impact classes, with decreasing severity:

A – Regions with a 'very high' or 'high' for all four hazards.

B – Regions classified as 'very high' or 'high' for three out of the four hazards.

C – Regions with varying impact across the hazards, for example regions with high or very high impact for one or two hazards but with low or very low impact for some other hazards, or regions with a medium impact for all four hazards. Regions of this class are not further analysed here since they do not represent extremes. Instead, the hazard-specific sections provide more detailed information.

D – Regions for which three out of four hazards are classified as 'low' or 'very low'.

E – Regions with a 'low' or 'very low' for all 4 hazards.

Subsequently, the same comparisons with adaptive capacity and the EU structural fund allocations as described in sections 2.2.5 and 2.3 were performed, but taking overall impact classes A and B as cut-off criterion. Hence, hotspots of vulnerability are those regions that are classified as either A or B and also have an adaptive capacity below the 0.25 percentile of all EU27 regions.

5.2. Results

The overall hazard impact for the baseline period reveals a distinctive pattern for low impact regions which are clustered in north-west Europe comprising of Scandinavia, the northern half of the UK, and Ireland, as well as the Alpine region (see Figure 5.1a). Also in Eastern Europe some isolated low overall impact regions are found. In contrast, the pattern of high overall impact is less distinctive with high impact regions (i.e. red and dark red coloured in map) scattered throughout Europe. A cluster of regions is found in eastern Germany and western Poland, also stretching southwards into Czech Republic. The most heavily affected countries with a majority of their NUTS-2 regions being high overall impact regions are Portugal, Italy and Bulgaria while in Poland about one third of the regions fall into one of the two high overall impact classes. In total, 49 regions are high impact regions (classes A and B) while 61 regions show a low overall hazard impact (classes D and E, see Table 5.1). A total number of 22 high impact regions mainly found in Portugal, southern Italy, and eastern Europe reveal a low adaptive capacity, thus being hotspots of particular vulnerability (see Table 5.2). Twelve of those regions currently (2007-2013 programming period) receive EU funding from the Structural funds of less than 23€ per capita (see Figure 5.1a).

Table 5.1: Number of NUTS-2 regions within the five overall hazard impact classes, for baseline period, scenario 2011-40 and scenario 2041-70.

Overall hazard impact class	Baseline	Scenario 2011-40	Scenario 2041-70
A – Regions with very high or high impact for all 4 hazards	9	15	23
B – Regions with very high or high impact for 3 of 4 hazards	40	55	85
C – Regions with varying impact across hazards	146	141	110
D – Regions with very low or low impact for 3 of 4 hazards	43	27	24
E – Regions with very low or low impact for all 4 hazards	18	18	14

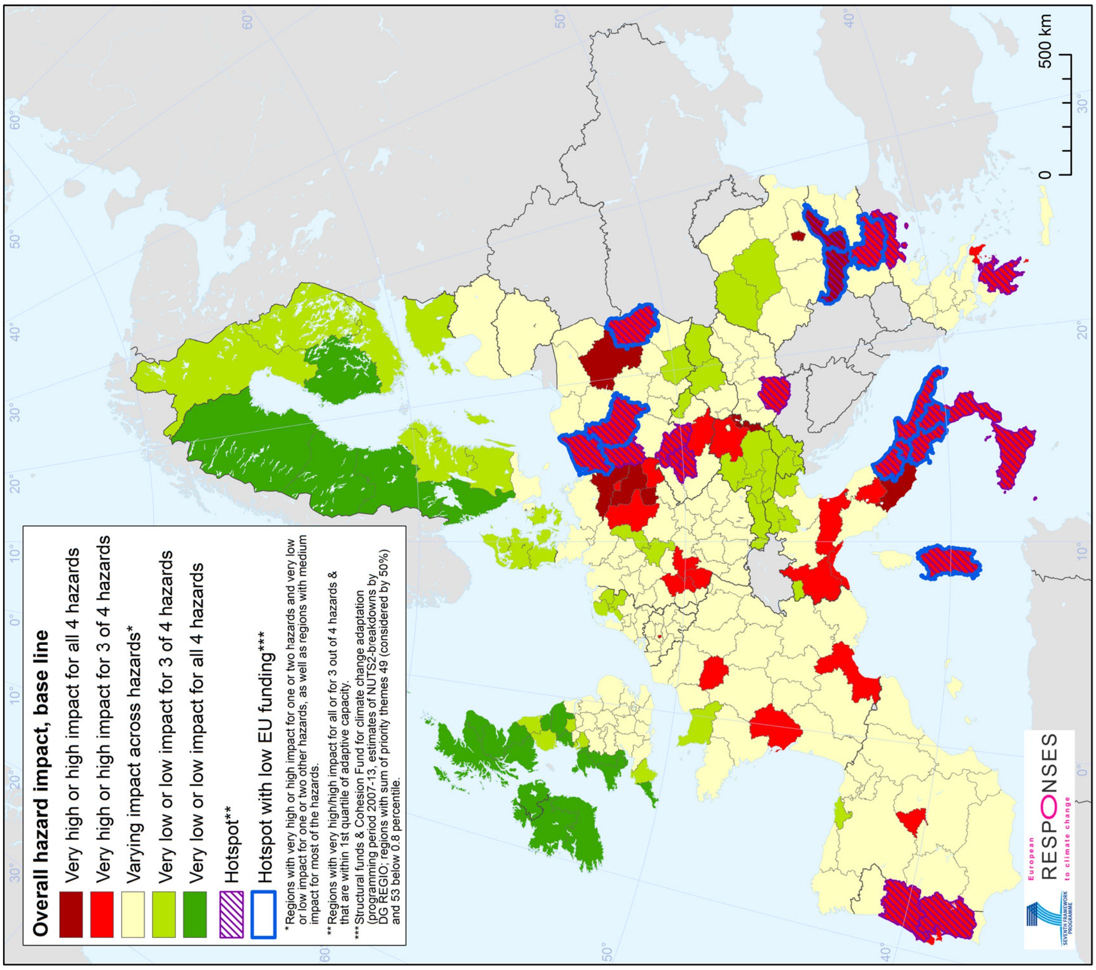

Figure 5.1(a): Map of overall hazard impact together with vulnerability hotspots, at NUTS-2 administrative level for EU27, baseline period.

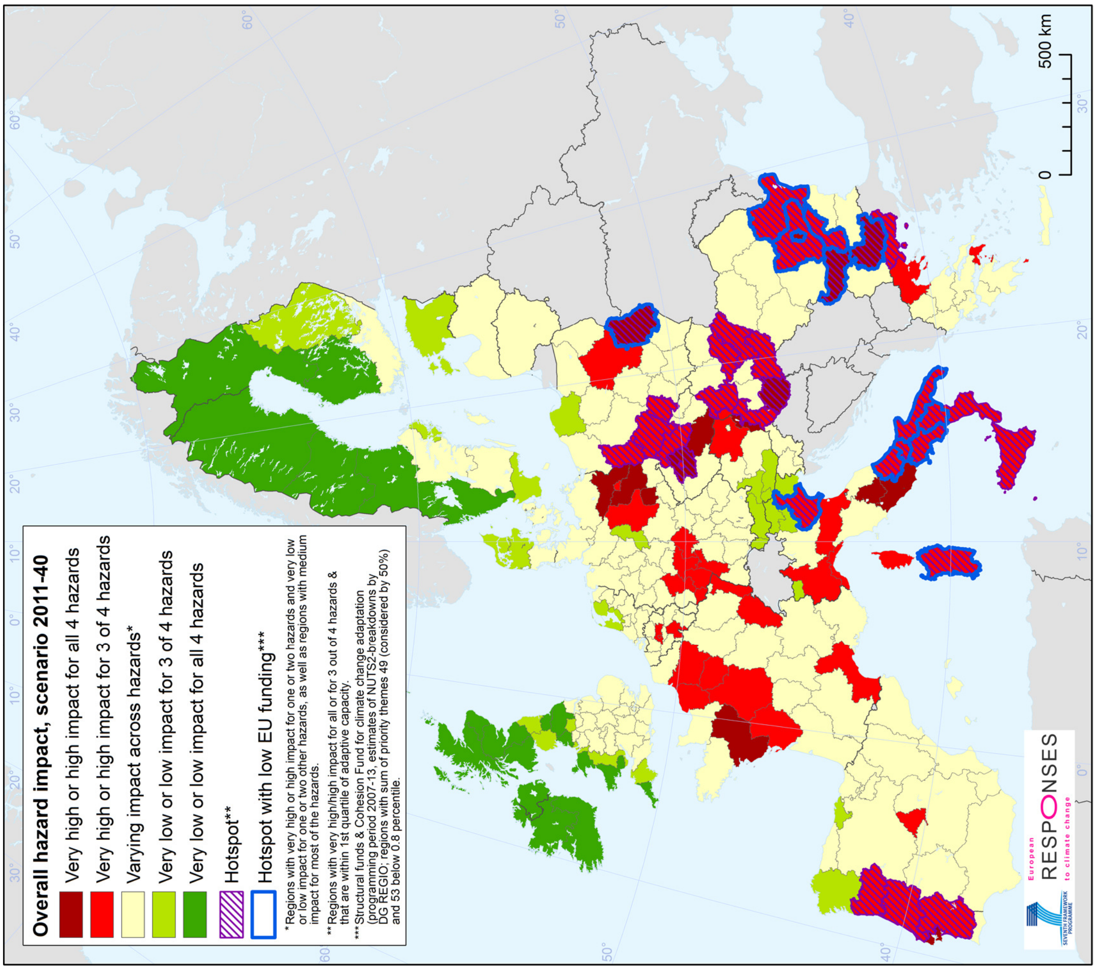

Figure 5.2(b): Map of overall hazard impact together with vulnerability hotspots, at NUTS-2 administrative level for EU27, scenario period 2011-2040.

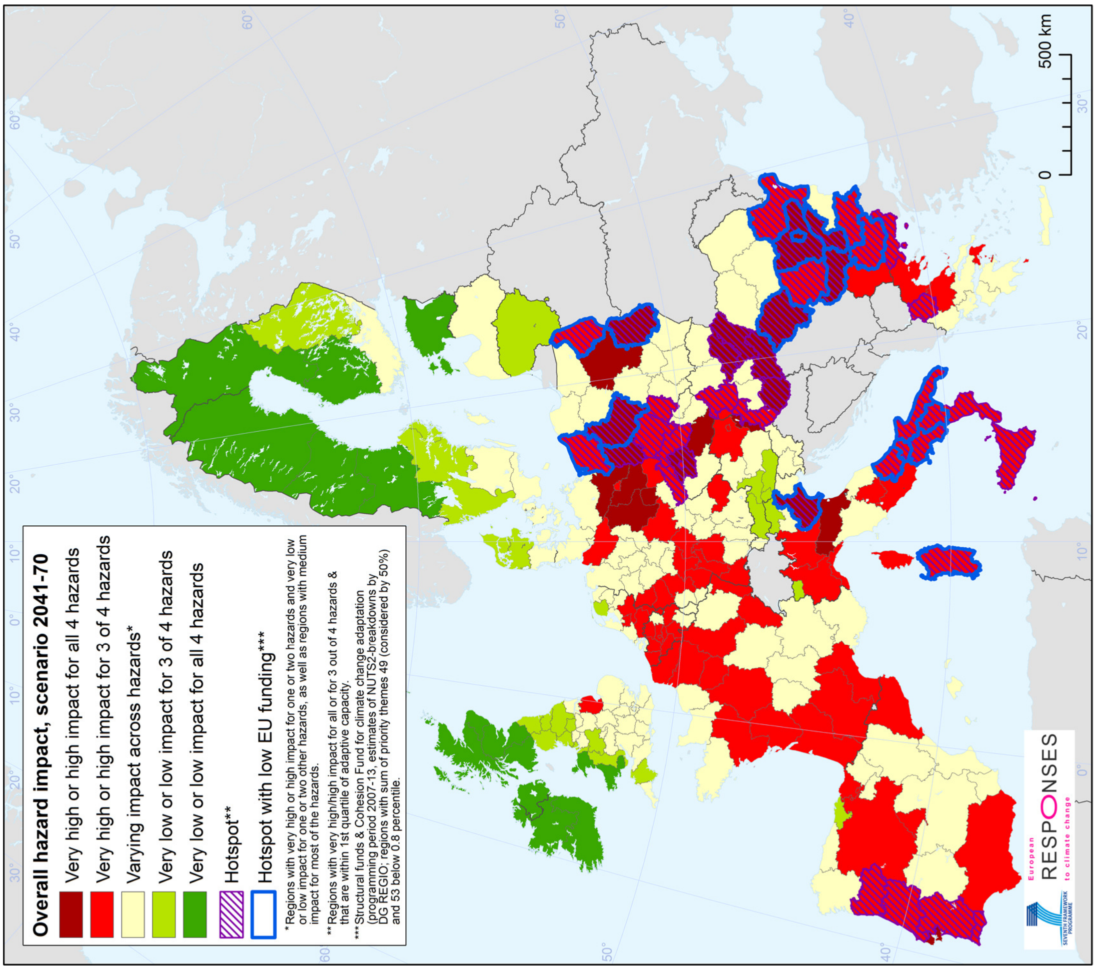

Figure 5.2(c): Map of overall hazard impact together with vulnerability hotspots, at NUTS-2 administrative level for EU27, scenario period 2041-2070.

Table 5.2: Potential overall hazard vulnerability – NUTS-2 hotspot regions for baseline period as well as the two scenario periods 2011-2040 and 2041-2070.

Period	NUTS-2 regions
Baseline	**22 regions**: BG31–Severozapaden, BG32–Severen tsentralen, BG42–Yuzhen tsentralen, CZ02–Strední Cechy, CZ05–Severovýchod, GR11–Anatoliki Makedonia, GR25–Peloponnisos, HU23–Dél-Dunántúl, ITF1–Abruzzo, ITF2–Molise, ITF3–Campania, ITF4–Puglia, ITF5–Basilicata, ITF6–Calabria, ITG1–Sicilia, ITG2–Sardegna, PL31–Lubelskie, PL41–Wielkopolskie, PL42–Zachodniopomorskie, PL43–Lubuskie, PT16–Centro, PT18–Alentejo
Scenario 2011-40	**30 regions**: BG31–Severozapaden, BG32–Severen tsentralen, BG42–Yuzhen tsentralen, CZ02–Strední Cechy, , CZ05–Severovýchod, GR11–Anatoliki Makedonia, HU22–Nyugat-Dunántúl, HU23–Dél-Dunántúl, HU31–Észak-Magyarország, HU32–Észak-Alföld, HU33–Dél-Alföld, ITD3–Veneto, ITF1–Abruzzo, ITF2–Molise, ITF3–Campania, ITF4–Puglia, ITF5–Basilicata, ITF6–Calabria, ITG1–Sicilia, ITG2–Sardegna, PL31–Lubelskie, PL43–Lubuskie, PL51– Dolnoslaskie, PL52–Opolskie, PT11–Norte, PT16–Centro, PT18–Alentejo, RO22–Sud-Est, RO31–Sud-Muntenia, SK02–Západné Slovensko
Scenario 2041-70	**39 regions**: BG31–Severozapaden, BG32–Severen tsentralen, BG34– Yugoiztochen, BG42–Yuzhen tsentralen, CZ02–Strední Cechy, CZ04– Severozápad, CZ05–Severovýchod, GR11–Anatoliki Makedonia, GR13–Dytiki Makedonia, HU22–Nyugat-Dunántúl, HU23–Dél-Dunántúl, HU31–Észak-Magyarország, HU32–Észak-Alföld, HU33–Dél-Alföld, ITD3–Veneto, ITF1–Abruzzo, ITF2–Molise, ITF3–Campania, ITF4–Puglia, ITF5–Basilicata, ITF6–Calabria, ITG1–Sicilia, ITG2–Sardegna, PL31–Lubelskie, PL34–Podlaskie, PL41–Wielkopolskie, PL42–Zachodniopomorskie, PL43–Lubuskie, PL51– Dolnoslaskie, PL52–Opolskie, PT11–Norte, PT15–Algarve, PT16–Centro, PT18–Alentejo, RO22–Sud-Est, RO31–Sud-Muntenia, RO41–Sud-Vest Oltenia, RO42–Vest, SK02–Západné Slovensko

For the scenario period 2011-2040, the number of high overall impact regions is projected to increase to 70 whereas the number of low overall impact regions decreases to 45 (see Table 5.1). Regions that are rated new high impact regions in 2011-40 are mainly found in France, south-western Germany, south-eastern Romania, Hungary, and Slovakia (see Figure 5.1b). All low impact regions in eastern Europe are projected to disappear for the period 2011-2040. If the adaptive capacity would remain in the scenario the same as for the baseline period, in 2011-40 the number of high vulnerability regions would increase from 21 to 30 (see Table 5.2). Most of the new high vulnerability regions are found in eastern Europe, which for 2011-2040 become new high overall impact regions. The trend of an increasing overall hazard impact is further accelerating for 2041-2070 with now 108 projected to be high impact regions, which is 42% of all NUTS-2 regions. At the same time the low impact regions further decrease to 38 (see Table 5.1). The spatial distribution of high impact regions for 2041-2070 (Figure 5.1c) reveals that now some Spanish regions are projected to be affected as well. New high overall impact regions are also found in western Poland and eastern Germany, as well as in a strip along the Rhine valley from south western Germany to the southern Netherlands. Most Belgian and northern French regions are now also classified as high overall impact regions. Figure 5.1c further shows that almost all regions of category A (worst impact regions) are found in eastern Europe which is also the part of Europe where most of the now 39 high vulnerability regions (see Table 5.2) are found. The temporal evolvement of the low impact regions reveals that Ireland and the northern half of the UK and Scandinavia remain almost unaffected while some southern Scandinavian regions as well as some regions at the foot of the Alps loose their class D or E status (low impact) and turn into regions with varying impact (class C).

6. Discussion and conclusions

6.1.1. Indicator-based pan-European multi-hazard assessment

Climate change is expected to impact on the European continent in the coming decades, and may lead to increases in regional differences in available natural resources, and risks to assets and economic activities (IPCC, 2007b). A key challenge for assessing the magnitude of climate change impacts and identifying hotspots of vulnerability is the comparison among regions as well as among climate-caused hazards and associated risks (Eriksen and Kelly, 2007). In this context, indicators are frequently employed to measure and simplify complex interacting processes, and to monitor changes in space and time (EEA-JRC-WHO, 2008; EEA, 2010). However, their use is subject to an intense ongoing scientific debate centred on a number of issues. Three of the most important issues are: credibility and transparency; scale and level of detail; and data availability. These issues will be discussed in more detail in the following.

Several authors have argued that most existing climate-related indicator-based assessments suffer from a lack of credibility and transparency due to conceptual or methodological flaws, in particular when attempting to assess vulnerability (Barnett et al., 2008; Füssel, 2010; Hinkel, 2011). The main focus of the current study was put on establishing climate impact indicators based on a scientifically sound selection of factors that describe climate exposure as well as sensitivity to climate stimuli. Vulnerability was evaluated by comparing the resulting impact indicators with adaptive capacity. Finally, the analysis of the EU structural funds allocations was compared to the analysis of impacts and adaptive capacity, in order to identify critical locations within the EU where impacts are high, but adaptive capacity and EU investments on climate change are low.

Credibility and transparency: Generally, to overcome the problem of fuzziness and ambiguity of terminology, the work was built upon the known conceptual framework for climate change impact and vulnerability assessment by Füssel (2007) and the dimensions of assessment were clearly defined (cp. section 2.1.1). Earkin and Luers (2006) further mention the assignment of weights to input variables and the mathematics of aggregation as sources of deficiencies in existing studies. In order to ensure highest possible objectivity, the current study applies equal weights to the input parameters (with one clearly stated exception for forest fires) or employs a purely statistical approach that adjusts data-inherent characteristics, including overlaps of information. These techniques, as well as those used for aggregating the input parameters to impact and adaptive capacity indices are based on the recommendations and procedures for constructing indicators provided by OECD (2008) for constructing indicators. Explicit stakeholder involvement during the entire assessment and indicator construction process could further increase the basis of the results (Parachini et al., 2011; Schröter et al., 2005b).

Scale and level of detail: It has been argued that developing country-scale indices can lead a level of abstraction and simplification that dilutes the accurate reflection of a complex reality (Barnett et al., 2008). At the same time, other authors advocate the usefulness of explicit inter-country comparisons (e.g. Brooks et al., 2005). Undoubtedly, the spatial detail of the input data and their spatial aggregation is a crucial factor in the context of climate change impact assessments (Biesbroek et al., 2009) and several scholars have emphasised the importance of taking into account regional or local-scale processes and dynamics. These are the levels where determinants of impact and vulnerability are most apparent and tangible (Eriksen and Kelly, 2007). In this sense, the NUTS-2 analysis of this study is considered significantly more accurate than an analysis at the country level would have been. Nevertheless, capturing the impact of multiple hazards has inevitably led to simplifications and generalisations. Hence, the study certainly has limitations in terms of spatial and thematic resolution when comparing it to the level that detail local-scale studies would have. For instance, a grid-based synthetic index of land degradation related to droughts specifically developed for Italy by Salvati et al. (2009) provides insight into the spatial distribution of drought risk with greater spatial detail, while being based on a much larger variety of influencing factors. Therefore it should be emphasised that the four impact indicators presented here provide results for the aggregate NUTS-2 areas, and do not represent the impact for individual parcels of land. Changes in impacts within each region (positive and negative changes) may cancel each other out, and may therefore be obscured (as discussed for drought impacts below).

The current study can also not compete with the complexity of specialised hazard-specific biophysical modelling approaches. Taking again the drought indicator as example, comprehensive crop productivity studies such as made by Hermans et al. (2011) are able to compute potential changes in crop yield (e.g. crop yield variability or shifts in phonological phases) under climate change, an aspect not taken into consideration here. Indicators need to be adjusted for specific purposes and scales (Birkmann, 2007) and case studies are usually focussed on a particular sector and/or aspect to serve local decision making. On the contrary, even a systematic compilation of existing case study material would probably only provide a fragmented picture, based on diverging assumptions and conceptions rather than allowing for a truly consistent pan-European quantitative comparison of impacts from different climate and weather-related hazards. As such, the results of this work could provide a valuable basis for evaluating EU regional policy in the context of climate adaptation mainstreaming. Nonetheless, a verification and complementation of the pan-European regional-level results with more detailed local-level studies (Eriksen and Kelly, 2007) can help to interprete or correct the current assessment. The only known study that employed such a comparison of local level studies in order to complement a pan-European assessment has been conducted by the ESPON project (ESPON, 2011).

Data availability: Data availability is often a constraint for constructing indicators related to climate change impacts. Also more local impact assessments focussing on a single country such as a recent study for Germany by Rannow et al. (2010) have emphasised that compromises have to be made regarding input data, due to insufficient or incomplete data coverage. Data availability was even more challenging for this quantitative pan-European approach at a regional (NUTS-2) aggregation level. In particular, parameters that can be meaningfully used as proxies for sensitivity and adaptive capacity are scarce at EU-wide NUTS-2 level and, if available, are mostly limited to the current situation (see also ESPON, 2011). More detailed data on population structure (e.g. on elderly people, old-ages homes, patient-centred care), and including future projections, would for instance allow to further improve the heat stress assessment. Insufficient data availability is also the reason why elements of the physical infrastructure, such as facilities for energy or water supply, could not be considered in an explicit manner. Still, for each of the four hazards one or two sensitivity parameters on land use and/or population have been available for the scenario period(s) (cp. Tables 4.1, 4.4, 4.7 and 4.10), thus allowing to contrast projected climate dynamics with those of endogenous factors and regional characteristics such as population or land use.

6.1.2. Hazard impacts and vulnerabilities across the EU

All information on exposure to climate stimuli used in this study comes from regional climate model runs based on the SRES A1B scenario, generated within the FP6 ENSEMBLES project (van der Linden & Mitchell 2009). Uncertainties of the climate model outputs are considered particularly high for projected changes in extreme precipitation events (Kyselý et al., 2011) while for temperature the different RCMs produce less spread (Déqué et al., in press). In addition, uncertainties derive from the emission scenarios that drive the climate models. As these scenarios are based on normative assumptions, they are all equally valid and probabilities for one or the other cannot be quantified (Rannow et al. (2010). Also, in the current study we only used output for the A1B scenario, which limits the assessment to a rather high-end emission scenario. However, climate model differences can be addressed and taken into account in the analysis. One way of addressing the impact of climate model choice is to consider the results produced by different climate models for the same (A1B) emission scenario. Here, a compromise between computational effort and completeness in terms of available ENSEMBLES runs was made, by using simulation results from five regional climate models selected according to different institutions and different global climate model forcings (cp. section 2.1.3). The current analysis is based on averages from these five regional climate models, in order to account for (parts of) the range of climate change projected by these models. The effect of the different models on the impact indicator results can be evaluated at a later stage. In order to derive a more detailed picture of uncertainties associated with the climate data, a future analysis should construct five sets of impact indicators for each hazard (using the climate parameters from the five individual models) and compare the resulting matrix. This approach may become topic for subsequent research in the RESPONSES project.

The multi-hazard assessment revealed a heterogeneous picture of the spatial distribution of the hazard impact across the EU but mostly pointing in the same direction over time. This implies that most regions in Europe will be dealing with increasing heat stress, drought proneness, and forest fire danger (Figures 4.1d, 4.3d, and 4.6d). For flood risk the sign and magnitude of change vary across regions (Figures 4.2d), which is in line with other pan-European analyses (e.g. Feyen et al., in press). Despite some counteracting effects between climate dynamics and land use change (e.g. for regional agricultural drought impacts), the overall impact (combining information for all four weather hazards) showed a clear trend towards increasing impact from climate-related natural hazards for most parts of Europe in the coming decades (see Figures 5.1a-c). This is in line with the assessment of IPCC (2007a) and comprehensive studies such as by EAA-JRC-WHO (2008) that that have analysed impact and vulnerability assessment results from different projects, approaches, concepts and research traditions. The current study, with its limitations discussed above, provides for the first time an indicator-based pan-European multi-hazard climate change assessment combining the following criteria: (a) a strictly consistent methodology across multiple hazards, (b) regional (NUTS-2 level) spatial scale, and (c) spatially explicit, quantitative results for each hazard individually.

Table 6.1: Synopsis of individual hazard-specific impact and vulnerability hotspots – number of regions (impact hotspots, vulnerability hotspots and vulnerability hotspots with low EU funding), for baseline period as well as scenario periods 2011-2040 and 2041-2070.

Hazard	Type of hotspot	Baseline	Scenario 2011-40	Scenario 2041-70
Heat stress	Impact hotspot1	65	98	124
	Vulnerability hotspot2	7	20	28
	Vulnerability hotspot, low EU funding3	4	11	13
River floods	Impact hotspot1	64	75	74
	Vulnerability hotspot2	20	22	20
	Vulnerability hotspot, low EU funding3	8	7	6
Droughts	Impact hotspot1	65	63	67
	Vulnerability hotspot2	43	44	44
	Vulnerability hotspot, low EU funding3	24	26	27
Forest fires	Impact hotspot1	65	76	102
	Vulnerability hotspot2	26	29	32
	Vulnerability hotspot, low EU funding3	12	14	15

[1] Regions in 4th quartile of baseline impact indicator
[2] Regions in 4th quartile of baseline impact indicator AND in 1st quartile of adaptive capacity indicator
[3] Vulnerability hotspots with sum of priority themes 49 (considered by 50%) and 53 from EU Structural funds below 0.8 percentile (23€ per capita)

A synopsis of the individual hazard-specific findings (Table 6.1) shows that heat stress is projected to be the hazard with strongest increases in impact over time. From the analysis it follows that the number of regions that are an impact hotspot (defined as regions in 4^{th} quartile of baseline impact indicator) increases from 65 in the baseline period to 124 regions for the period 2041-70. This is caused by an increasing climate impact over time, strongly amplified by a demographic development towards an increasing share of elderly population in many European countries (von Breska, 2010). The second strongest increase over time is seen for forest fire danger (65 to 102 regions, baseline compared to the period 2041-70) while river floods only show a slight increase (65 to 74 regions). However, the latter, rather weak increase is believed to slightly under-represent the true impact as the numbers are affected by (a) the fact that flood modelling predicts a decreasing flood impact for 15 regions from the baseline to scenario 2041-70 off-setting some of the increase, and (b) the lack of data on changes in exposed population and assets for the two scenario periods (i.e. commercial and industrial areas in the flood zone were considered for the first scenario period 2011-40, but new settlements could not be considered). Increases for drought proneness are projected to be small due to off-setting effects with land use projections (that show a general decrease in agricultural areas). However, drought is the hazard that reveals the highest number of vulnerability hotspots throughout all time periods and in particular in East Europe. Again, it should be emphasised that the indicator represents the aggregate NUTS-2 situation and not the impact for individual plots of land. For instance, even though the drought indicator might show an overall stable situation for a NUTS-2 region due to decreasing agricultural demand, a comparison of the climate impact for the agricultural land within the region that remains cultivated would likely show an increase in drought proneness.

To conclude, this study has demonstrated that an indicator-based approach can be valuable for quantitative assessments of pan-European climate change impacts and vulnerability at the regional level. Based on a clearly defined conceptual framework applied to multiple hazards, it allows for full comparisons of climate impact across different hazards. Despite constraining factors, such as limited data availability and a rather high level of abstraction, it can help to gain understanding of the regional spatial patterns of climate change impact, derived from the exposure and sensitivity to climate stimuli, as well as endogenous changes in sensitivity due to socio-economic changes across Europe's regions. The vulnerability analysis identifies potential hotspots from a comparison of impacts with adaptive capacity based on simple percentile thresholds, and might help to initially flag vulnerable regions, and more localised analysis may give additional detail.

This analysis of the regional distribution of climate change across the EU is of particular value for the current discourse on climate adaptation mainstreaming, and could serve as input for the currently ongoing development of the EU adaptation strategy. Given the important role of the EU in funding economic development and convergence, it may also help to evaluate the role of the EU in funding adaptation to projected climate change. For instance, regional policy with the Structural Funds as climate adaptation funding instrument may increasingly take into account the relative distribution and expected impacts from climate change. The relevancy for the Structural Funds is underpinned by the fact that most of the projected regions with very high overall hazard impact are found in Eastern Europe. Since the study provides NUTS-2 level information, the results could form an important contribution for refining the distribution of EU-allocations earmarked for climate change adaptation. Efforts for heat stress prevention, fire fighting and prevention, or flood protection as part of regional projects could be informed by these climate impact assessments. Apart from more comprehensive uncertainty analysis in the future, the current work could be extended by a number of carefully selected in-depth case studies in regions flagged as impact and vulnerability hotspots.

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Appendix A – data winsorising

Table A.1: List of winsorised NUTS-2 regions for the parameters of all hazard impact indicators as well as for the adaptive capacity indicator.

Indicator	Baseline	Scenario 1	Scenario 2
Heat stress			
HE_T2MAX25	none	none	none
HE_T2MIN20	none	none	none
HE_HWDI	none	none	none
HS_POPD	none	none	---
HS_POP75	1 (ITC3)	3 (DED2, DED3, UKI1)	---
HS_HH65	none	---	---
River floods			
FE_AREA	7 (DE50, DE60, HU32, HU33, NL11, NL21, UKF3)	8 (DE50, DE60, HU32, HU33, NL11, NL 12, NL21, UKF3)	8 (DE50, DE60, HU32, HU33, NL11, NL 12, NL21, UKF3)
FE_DPTH	2 (GR30, NL42)	1 (GR30)	2 (GR30, NL42)
FS_POPD	9 (AT13, BE10, DE30, ES21, FR10, UKD3, UKG3, UKI1, UKI2)	9 (AT13, BE10, DE30, ES21, FR10, UKD3, UKG3, UKI1, UKI2)	9 (AT13, BE10, DE30, ES21, FR10, UKD3, UKG3, UKI1, UKI2)
FS_COM	5 (AT33, HU22, ITC2, ITD1, UKI1)	5 (AT32, AT33, HU22, ITD1, UKI1)	---
Droughts			
DE_CDDMAX	13 (CY00, ES43, ES61, GR22, GR25, GR30, GR41, GR42, GR43, ITG1, PT15, PT17, PT18)	10 (CY00, ES61, GR22, GR30, GR41, GR42, GR43, PT15, PT17, PT18)	8 (CY00, ES61, GR30, GR41, GR42, GR43, PT15, PT18)
DE_ARID	2 (ITC2, UKN0)	2 (ITC2, UKN0)	2 (ITC2, UKN0)
DE_PRECgr	2 (AT32, AT34)	2 (AT32, AT34)	2 (AT32, AT34)
DS_AGRI	8 (DK02, DK03, ITF4, NL34, UKE1, UKF3, UKH1, UKH3)	9 (DK02, DK03, HU33, ITF4, NL34, UKE1, UKF3, UKH1, UKH3)	6 (DK03, HU33, NL34, UKE1, UKF3, UKH1)
DS_EMPL	9 (GR11, GR25, PL31, PL34, RO11, RO21, RO22, RO31, RO41)	---	---
DS_SOIL*	15 (DE30, DE41, DE42, DE93, DE94, DK05, FI13, FI18, FI19, FI1A, FI20, NL13, NL21, NL22, NL41)	---	---
Forest fires			
FFE_CDDMAX	see DE_CDDMAX	see DE_CDDMAX	see DE_CDDMAX
FFE_T2MEANsu	none	none	none
FFE_PRECsu	4 (AT21, AT32, AT33, AT34)	4 (AT21, AT32, AT33, AT34)	4 (AT21, AT32, AT33, AT34)
FFS_WILDL	none	none	none
FFS_ACCESS	6 (FI1A, SE32, SE33, UKM2, UKM5, UKM6)	---	---
FFS_COMBU	4 (UKH2, KUH3, UKI1, UKI2)		
Adaptive capacity			
AC_PPS	3 (BE10, LU00, UKI1)	---	---
AC_DOC	6 (AT13, BE31, DE91, DK01, SE11, UKH1)	---	---
AC_EDU	none	---	---
AC_R&D	6 (DE11, DE21, CZ01, ES23, GR30, SK01)	---	---
AC_INET	none	---	---

* Values for the listed regions were deemed to be unreliable outliers compared to neighbouring regions. They were therefore not winsorised following the approach presented in Chapter 2.2.1 but were replaced with values from their neighbouring regions or the national average, on a case by case basis.

Appendix B – tables with individual impact indicator values

Table B.1: Heat stress – normalised (shifted by 10) individual input parameters as well as final impact indicator for baseline period, scenario period 2011-40 and scenario period 2041-70, for each NUTS-2 region. Furthermore, the NUTS-2 ranking is given (1 = highest impact, 261 = lowest impact; light grey = regions within 4th quartile of baseline; dark grey = regions additionally within the 1st quartile of adaptive capacity, i.e. vulnerability hotspot regions). (HE_TCOMB = mean of HE_T2MAX25 and HE_T2MIN20; HS_PCOMB = mean of HS_POP75 and HS_HH65).

		Baseline period						Scenario period 2011-40						Scenario period 2041-70					
ID	NUTS-2 name	HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	Rank	HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	Rank	HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	Rank
DEC0	Saarland	9.72	10.61	10.75	10.88	10.48	25	10.19	12.51	10.60	11.20	11.09	4	11.01	12.27	10.60	11.20	11.25	3
AT11	Burgenland (A)	10.15	9.99	9.39	10.78	10.07	93	10.79	10.51	9.38	10.62	10.31	84	11.45	10.55	9.38	10.62	10.47	69
AT12	Niederösterreich	9.77	10.20	9.46	10.21	9.91	140	10.23	11.09	9.52	10.09	10.22	97	10.86	11.79	9.52	10.09	10.53	61
AT13	Wien	10.15	10.20	13.58	9.92	10.87	2	10.80	10.59	13.58	9.19	10.93	8	11.43	11.23	13.58	9.19	11.25	4
AT21	Kärnten	9.23	8.98	9.25	10.47	9.46	240	9.40	9.77	9.22	10.56	9.73	223	9.77	9.85	9.22	10.56	9.84	216
AT22	Steiermark	9.33	9.25	9.38	10.41	9.58	225	9.54	10.61	9.38	10.19	9.92	174	9.99	9.99	9.38	10.19	9.88	208
AT31	Oberösterreich	9.45	9.80	9.70	9.85	9.70	207	9.71	11.23	9.70	9.80	10.09	129	10.23	10.56	9.70	9.80	10.07	159
AT32	Salzburg	9.13	9.02	9.38	9.51	9.26	252	9.23	9.51	9.40	9.82	9.49	247	9.47	8.96	9.40	9.82	9.41	249
AT33	Tirol	9.07	8.70	9.21	9.45	9.10	257	9.14	9.17	9.25	9.60	9.29	251	9.35	8.91	9.25	9.60	9.28	252
AT34	Vorarlberg	9.20	9.65	9.83	9.12	9.45	242	9.38	9.93	9.87	9.42	9.65	234	9.87	10.33	9.87	9.42	9.87	213
BE10	Région de Bruxelles	9.49	10.59	13.58	9.79	10.75	9	9.67	10.59	13.58	8.91	10.55	38	10.25	10.27	13.58	8.91	10.62	50
BE21	Prov. Antwerpen	9.47	11.25	11.20	10.33	10.53	19	9.62	10.36	11.28	10.06	10.31	82	10.13	10.90	11.28	10.06	10.58	54
BE22	Prov. Limburg (B)	9.52	11.40	10.58	9.61	10.25	60	9.72	11.60	10.63	10.01	10.47	50	10.33	11.58	10.63	10.01	10.62	48
BE23	Prov. Oost-Vlaanderen	9.43	11.20	10.92	10.38	10.46	27	9.60	10.47	10.99	10.07	10.27	88	10.11	10.30	10.99	10.07	10.36	99
BE24	Prov. Vlaams Brabant	9.47	11.27	10.98	10.29	10.48	26	9.64	10.53	11.10	9.99	10.30	87	10.21	10.52	11.10	9.99	10.45	76
BE25	Prov. West-Vlaanderen	9.34	10.44	10.65	10.96	10.33	47	9.48	9.47	10.67	10.96	10.12	121	9.90	9.66	10.67	10.96	10.28	110
BE31	Prov. Brabant Wallon	9.42	11.29	10.57	9.75	10.23	62	9.59	10.65	10.73	9.62	10.13	116	10.16	10.20	10.73	9.62	10.17	134
BE32	Prov. Hainaut	9.41	11.35	10.58	10.25	10.37	41	9.55	10.70	10.65	9.73	10.15	115	10.09	10.09	10.65	9.73	10.14	144
BE33	Prov. Liège	9.41	11.17	10.37	10.30	10.29	54	9.63	12.01	10.47	9.79	10.43	55	10.32	11.41	10.47	9.79	10.48	66
BE34	Prov. Luxembourg (B)	9.38	11.71	9.24	9.92	10.02	109	9.56	11.90	9.34	9.30	9.97	155	10.23	11.22	9.34	9.30	10.00	179
BE35	Prov. Namur	9.39	10.68	9.74	10.02	9.95	124	9.53	11.98	9.84	9.61	10.19	102	10.12	10.83	9.84	9.61	10.09	154
BG31	Severozapaden	11.16	10.15	9.14	10.23	10.14	78	12.04	9.35	8.97	10.27	10.09	130	12.55	10.41	8.97	10.27	10.48	67
BG32	Severen tsentralen	11.50	10.22	9.27	9.31	10.04	103	12.32	9.09	9.16	9.56	9.95	160	12.77	9.51	9.16	9.56	10.16	138
BG33	Severoiztochen	11.39	9.42	9.33	8.74	9.67	211	12.26	8.86	9.26	8.96	9.74	221	12.74	9.33	9.26	8.96	9.96	190
BG34	Yugoiztochen	11.57	9.47	9.22	9.05	9.78	186	12.40	8.75	9.15	9.13	9.76	219	12.86	9.48	9.15	9.13	10.05	165
BG41	Yugozapaden	10.14	10.19	9.60	9.05	9.73	198	11.23	10.13	9.59	8.90	9.92	173	11.95	11.02	9.59	8.90	10.30	105
BG42	Yuzhen tsentralen	11.13	10.34	9.34	9.07	9.94	128	12.05	9.85	9.25	9.25	10.04	142	12.60	10.31	9.25	9.25	10.27	116
CY00	Cyprus	13.11	8.62	9.45	7.93	9.59	222	13.34	8.65	9.67	7.91	9.69	228	13.46	8.45	9.67	7.91	9.66	237
CZ01	Praha	9.87	10.59	13.22	9.78	10.78	6	10.48	12.11	13.27	9.70	11.31	1	11.11	12.19	13.27	9.70	11.49	1
CZ02	Strední Cechy	9.76	11.06	9.64	9.16	9.88	149	10.28	12.17	9.75	9.39	10.35	76	10.91	12.18	9.75	9.39	10.50	62
CZ03	Jihozápad	9.50	10.98	9.34	9.22	9.73	197	9.78	11.59	9.33	9.78	10.08	132	10.39	12.37	9.33	9.78	10.41	89
CZ04	Severozápad	9.62	11.90	9.78	8.69	9.93	130	10.11	12.65	9.75	9.38	10.40	66	10.76	11.78	9.75	9.38	10.38	96
CZ05	Severovýchod	9.56	10.89	9.71	9.25	9.83	167	9.92	11.93	9.69	9.85	10.31	83	10.48	12.43	9.69	9.85	10.56	56
CZ06	Jihovýchod	9.65	10.34	9.70	9.37	9.76	194	10.08	11.44	9.67	9.83	10.23	94	10.68	11.93	9.67	9.83	10.49	64
CZ07	Strední Morava	9.54	10.58	9.78	9.26	9.78	184	9.89	11.35	9.74	9.85	10.19	105	10.42	10.88	9.74	9.85	10.21	124
CZ08	Moravskoslezsko	9.50	10.66	10.23	8.92	9.81	177	9.80	11.59	10.14	9.63	10.26	89	10.23	10.05	10.14	9.63	10.01	173
DE11	Stuttgart	9.69	11.29	10.68	10.09	10.42	35	10.16	12.10	10.63	10.52	10.83	16	10.92	12.42	10.63	10.52	11.10	9
DE12	Karlsruhe	9.88	11.34	10.72	10.27	10.54	18	10.43	12.40	10.78	10.27	10.94	6	11.18	12.71	10.78	10.27	11.20	5
DE13	Freiburg	9.61	11.30	10.23	10.25	10.33	46	10.12	12.41	10.20	10.59	10.79	17	10.97	12.33	10.20	10.59	11.00	12
DE14	Tübingen	9.54	11.52	10.10	9.96	10.25	58	10.01	12.22	10.08	10.33	10.62	29	10.83	11.97	10.08	10.33	10.78	27
DE21	Oberbayern	9.53	10.68	10.27	9.95	10.10	88	9.99	12.13	10.44	9.82	10.56	37	10.70	10.93	10.44	9.82	10.46	74
DE22	Niederbayern	9.55	10.56	9.67	10.19	9.98	115	9.93	11.78	9.69	10.26	10.38	69	10.60	11.40	9.69	10.26	10.47	71
DE23	Oberpfalz	9.59	12.46	9.65	10.19	10.41	37	9.97	11.86	9.62	10.30	10.40	65	10.65	12.79	9.62	10.30	10.78	28
DE24	Oberfranken	9.59	11.97	9.87	10.73	10.50	24	9.96	12.58	9.76	10.98	10.76	21	10.62	12.48	9.76	10.98	10.92	17
DE25	Mittelfranken	9.70	12.02	10.24	10.34	10.54	17	10.14	12.39	10.23	10.42	10.76	23	10.84	12.28	10.23	10.42	10.91	18
DE26	Unterfranken	9.77	11.29	9.90	10.37	10.32	49	10.29	12.92	9.83	10.76	10.89	12	10.97	11.95	9.83	10.76	10.85	25
DE27	Schwaben	9.51	10.97	10.00	10.26	10.17	74	9.94	12.19	9.99	10.51	10.62	30	10.65	11.51	9.99	10.51	10.65	44
DE30	Berlin	10.09	11.23	13.58	9.73	11.06	1	10.60	11.04	13.58	9.98	11.22	2	11.04	11.20	13.58	9.98	11.38	2
DE41	Brandenburg - Nordost	9.83	10.78	9.38	10.22	10.04	102	10.30	11.04	9.32	11.39	10.48	48	10.75	10.30	9.32	11.39	10.41	88
DE42	Brandenburg - Südwest	10.14	11.51	9.57	10.35	10.37	42	10.66	11.78	9.50	11.25	10.76	22	11.12	11.17	9.50	11.25	10.73	32
DE50	Bremen	9.61	10.19	12.54	10.77	10.72	11	9.90	10.59	12.68	10.35	10.83	14	10.33	9.07	12.68	10.35	10.53	60
DE60	Hamburg	9.53	10.59	13.12	10.17	10.77	8	9.83	10.95	13.58	9.24	10.78	18	10.26	8.98	13.58	9.24	10.37	97
DE71	Darmstadt	9.92	11.37	10.99	10.14	10.59	14	10.50	12.73	10.99	10.41	11.12	3	11.16	12.19	10.99	10.41	11.17	7
DE72	Gießen	9.64	11.39	10.08	10.37	10.35	44	10.13	11.24	10.00	10.64	10.49	47	10.81	11.68	10.00	10.64	10.76	29
DE73	Kassel	9.59	11.33	9.86	10.93	10.40	38	10.01	11.52	9.76	11.21	10.60	33	10.65	11.27	9.76	11.21	10.71	34
DE80	Mecklenburg-Vorpommern	9.55	10.25	9.37	10.25	9.85	163	9.89	10.45	9.27	11.31	10.20	99	10.33	9.41	9.27	11.31	10.05	164
DE91	Braunschweig	9.53	11.38	10.10	10.85	10.44	31	9.88	11.53	10.09	10.46	10.47	49	10.43	10.01	10.09	10.46	10.25	119
DE92	Hannover	9.59	10.84	10.24	10.75	10.35	45	9.89	11.14	10.22	10.79	10.50	46	10.42	10.24	10.22	10.79	10.41	87
DE93	Lüneburg	9.56	10.57	9.64	10.36	10.02	107	9.85	11.49	9.62	10.83	10.42	60	10.29	9.82	9.62	10.83	10.13	146
DE94	Weser-Ems	9.54	10.23	9.94	10.06	9.94	127	9.82	10.66	10.01	10.02	10.12	122	10.27	9.59	10.01	10.02	9.97	187
DEA1	Düsseldorf	9.65	11.30	11.80	10.59	10.80	3	9.92	11.27	11.76	10.56	10.86	13	10.56	11.67	11.76	10.56	11.13	8
DEA2	Köln	9.66	11.45	11.17	10.10	10.57	15	10.01	11.81	11.20	10.20	10.78	19	10.67	12.14	11.20	10.20	11.03	10
DEA3	Münster	9.69	11.34	10.68	10.20	10.46	28	10.00	10.82	10.65	10.26	10.43	56	10.59	11.97	10.65	10.26	10.85	24
DEA4	Detmold	9.60	11.01	10.50	10.49	10.39	39	9.92	11.09	10.41	10.63	10.50	45	10.50	11.25	10.41	10.63	10.69	37
DEA5	Arnsberg	9.55	12.02	10.90	10.59	10.73	10	9.90	10.37	10.80	10.67	10.43	57	10.53	11.87	10.80	10.67	10.96	14
DEB1	Koblenz	9.66	11.78	10.04	10.78	10.53	21	10.13	11.92	9.95	11.14	10.76	24	10.84	12.02	9.95	11.14	10.97	13

ID	NUTS-2 name	Baseline period						Scenario period 2011-40						Scenario period 2041-70					
		HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	Rank	HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	Rank	HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	Rank
DEB2	Trier	9.58	12.14	9.60	10.71	10.46	**29**	9.98	12.19	9.72	9.95	10.41	**62**	10.73	11.89	9.72	9.95	10.54	**59**
DEB3	Rheinhessen-Pfalz	9.95	11.47	10.44	10.38	10.54	**16**	10.51	12.37	10.45	10.45	10.92	**9**	11.27	12.78	10.45	10.45	11.20	**6**
DED1	Chemnitz	9.54	11.88	10.28	11.63	10.79	**5**	9.94	11.75	10.04	12.19	10.94	**7**	10.57	11.41	10.04	12.19	11.02	**11**
DED2	Dresden	9.95	12.06	10.13	11.10	10.78	**7**	10.56	11.81	9.93	12.01	11.04	**5**	11.06	10.04	9.93	12.01	10.73	**33**
DED3	Leipzig	10.01	12.17	10.26	10.87	10.80	**4**	10.54	11.62	10.18	11.32	10.90	**10**	11.05	10.67	10.18	11.32	10.80	**26**
DEE0	Sachsen-Anhalt	9.83	11.67	9.69	10.93	10.50	**23**	10.29	11.74	9.50	11.98	10.83	**15**	10.80	10.45	9.50	11.98	10.65	**45**
DEF0	Schleswig-Holstein	9.42	10.17	10.00	10.47	10.01	**111**	9.68	9.96	10.02	10.85	10.12	**123**	10.07	9.17	10.02	10.85	10.01	**175**
DEG0	Thüringen	9.58	11.42	9.82	10.71	10.36	**43**	9.96	11.88	9.65	11.80	10.78	**20**	10.58	10.45	9.65	11.80	10.59	**52**
DK01	Hovedstaden	9.21	9.31	11.25	10.13	9.94	**126**	9.51	8.98	11.35	10.00	9.93	**172**	9.91	9.98	11.35	10.00	10.29	**107**
DK02	Sjælland	9.25	8.91	9.65	10.42	9.54	**234**	9.53	9.41	9.72	10.93	9.88	**188**	9.96	9.60	9.72	10.93	10.04	**169**
DK03	Syddanmark	9.26	10.09	9.56	10.54	9.85	**161**	9.46	9.93	9.59	10.88	9.95	**163**	9.79	9.72	9.59	10.88	9.98	**183**
DK04	Midtjylland	9.22	10.18	9.53	9.98	9.72	**201**	9.41	9.79	9.58	10.28	9.76	**217**	9.71	9.35	9.58	10.28	9.72	**232**
DK05	Nordjylland	9.17	9.56	9.37	10.69	9.68	**210**	9.33	9.28	9.38	11.00	9.72	**225**	9.58	8.97	9.38	11.00	9.70	**235**
EE00	Estonia	9.31	10.04	8.90	10.14	9.58	**223**	9.73	10.93	8.87	10.02	9.86	**194**	10.03	9.33	8.87	10.02	9.55	**243**
ES11	Galicia	9.78	9.98	9.52	10.31	9.89	**144**	10.27	9.61	9.49	10.08	9.86	**195**	10.96	10.25	9.49	10.08	10.18	**130**
ES12	Principado de Asturias	9.75	9.42	9.57	10.54	9.81	**176**	10.16	9.76	9.52	10.24	9.92	**176**	10.77	9.87	9.52	10.24	10.09	**155**
ES13	Cantabria	9.56	9.50	9.61	9.77	9.61	**219**	9.96	8.90	9.68	9.43	9.49	**246**	10.55	9.50	9.68	9.43	9.78	**225**
ES21	Pais Vasco	9.89	9.73	10.43	9.58	9.90	**141**	10.36	9.56	10.42	9.71	10.00	**146**	11.03	10.04	10.42	9.71	10.29	**109**
ES22	Comunidad Foral de Navarra	10.38	9.98	9.22	9.53	9.77	**191**	11.08	9.91	9.31	9.15	9.83	**198**	11.74	10.16	9.31	9.15	10.04	**167**
ES23	La Rioja	10.34	9.89	9.25	9.70	9.79	**180**	10.97	9.73	9.37	9.09	9.76	**214**	11.64	10.08	9.37	9.09	10.00	**177**
ES24	Aragón	10.95	9.36	8.83	10.24	9.81	**175**	11.85	9.39	8.89	9.39	9.82	**203**	12.45	9.15	8.89	9.39	9.87	**211**
ES30	Comunidad de Madrid	11.52	9.13	11.44	8.59	10.08	**90**	12.37	9.52	11.65	8.58	10.42	**61**	12.86	9.11	11.65	8.58	10.40	**90**
ES41	Castilla y León	10.41	9.93	8.83	10.81	9.96	**120**	11.17	9.64	8.82	10.11	9.90	**183**	11.90	9.97	8.82	10.11	10.14	**142**
ES42	Castilla-la Mancha	11.61	9.03	8.79	9.73	9.73	**200**	12.42	9.17	8.92	8.69	9.70	**227**	12.89	9.03	8.92	8.69	9.75	**228**
ES43	Extremadura	12.18	9.39	8.82	9.73	9.95	**122**	12.77	8.92	8.83	9.06	9.77	**212**	13.09	9.53	8.83	9.06	10.00	**178**
ES51	Cataluña	11.02	8.91	10.17	9.14	9.77	**187**	11.91	8.80	10.35	8.75	9.87	**191**	12.51	9.01	10.35	8.75	10.05	**163**
ES52	Comunidad Valenciana	12.05	8.46	10.10	8.85	9.77	**189**	12.67	8.65	10.37	8.44	9.90	**184**	13.03	8.65	10.37	8.44	9.97	**188**
ES53	Illes Balears	12.21	8.34	10.09	8.42	9.65	**213**	12.79	8.55	10.36	8.21	9.82	**202**	13.10	8.34	10.36	8.21	9.82	**220**
ES61	Andalucia	12.20	8.68	9.50	8.55	9.63	**215**	12.78	8.88	9.64	8.19	9.73	**222**	13.09	8.99	9.64	8.19	9.82	**221**
ES62	Región de Murcia	12.40	8.34	9.70	8.39	9.58	**226**	12.89	8.65	9.95	7.85	9.66	**233**	13.17	8.67	9.95	7.85	9.72	**234**
FI13	Itä-Suomi	9.24	10.82	8.42	11.25	9.87	**153**	9.66	10.22	8.33	12.07	9.98	**151**	9.90	9.95	8.33	12.07	9.98	**185**
FI18	Etelä-Suomi	9.27	10.96	9.29	9.89	9.83	**168**	9.65	10.42	9.29	10.40	9.93	**171**	9.96	10.15	9.29	10.40	9.94	**194**
FI19	Länsi-Suomi	9.22	10.84	8.77	10.79	9.86	**158**	9.43	9.90	8.75	11.18	9.78	**211**	9.63	10.01	8.75	11.18	9.85	**215**
FI1A	Pohjois-Suomi	9.14	9.05	8.22	9.90	9.06	**259**	9.36	8.90	8.22	10.46	9.20	**255**	9.61	8.73	8.22	10.46	9.21	**255**
FI20	Åland	9.24	9.63	8.65	10.57	9.50	**238**	10.18	8.66	8.77	11.07	9.62	**237**	10.81	8.98	8.77	11.07	9.85	**214**
FR10	Île de France	9.82	10.28	11.77	8.99	10.17	**75**	10.24	11.40	11.93	8.75	10.51	**44**	10.95	11.28	11.93	8.75	10.66	**42**
FR21	Champagne-Ardenne	9.71	10.74	9.17	10.34	9.97	**117**	10.03	10.94	9.13	10.67	10.17	**111**	10.82	11.37	9.13	10.67	10.46	**73**
FR22	Picardie	9.54	11.00	9.56	9.75	9.95	**123**	9.78	10.90	9.56	9.94	10.03	**143**	10.39	10.55	9.56	9.94	10.10	**152**
FR23	Haute-Normandie	9.51	10.12	9.85	9.97	9.86	**157**	9.79	10.50	9.85	10.18	10.08	**134**	10.33	10.22	9.85	10.18	10.14	**143**
FR24	Centre	9.88	10.48	9.29	10.90	10.12	**82**	10.33	10.71	9.32	10.91	10.30	**86**	11.12	10.98	9.32	10.91	10.56	**57**
FR25	Basse-Normandie	9.42	9.44	9.45	10.92	9.79	**179**	9.70	9.78	9.45	11.09	9.99	**150**	10.17	10.61	9.45	11.09	10.31	**103**
FR26	Bourgogne	9.83	10.26	9.17	11.35	10.12	**83**	10.29	10.89	9.16	11.46	10.41	**63**	11.12	10.75	9.16	11.46	10.58	**53**
FR30	Nord - Pas-de-Calais	9.38	11.04	10.53	9.61	10.12	**85**	9.53	10.15	10.51	9.62	9.95	**164**	10.03	10.17	10.51	9.62	10.08	**157**
FR41	Lorraine	9.65	10.48	9.57	10.18	9.96	**121**	9.99	11.92	9.54	10.34	10.41	**64**	10.78	11.99	9.54	10.34	10.63	**47**
FR42	Alsace	9.86	10.68	10.18	9.72	10.10	**87**	10.42	12.25	10.24	9.85	10.65	**27**	11.24	12.63	10.24	9.85	10.94	**15**
FR43	Franche-Comté	9.72	10.34	9.36	10.32	9.93	**132**	10.14	10.81	9.37	10.45	10.18	**110**	10.92	11.36	9.37	10.45	10.50	**63**
FR51	Pays de la Loire	9.93	10.25	9.63	10.42	10.05	**97**	10.47	10.00	9.72	10.34	10.13	**120**	11.16	10.60	9.72	10.34	10.44	**80**
FR52	Bretagne	9.44	9.63	9.67	10.85	9.88	**147**	9.80	9.43	9.75	10.70	9.91	**178**	10.31	10.33	9.75	10.70	10.27	**115**
FR53	Poitou-Charentes	10.11	10.44	9.32	11.51	10.32	**48**	10.71	9.34	9.37	11.40	10.16	**112**	11.45	10.97	9.37	11.40	10.76	**30**
FR61	Aquitaine	10.26	9.80	9.40	11.18	10.14	**79**	10.89	9.75	9.48	10.95	10.25	**92**	11.61	10.55	9.48	10.95	10.62	**51**
FR62	Midi-Pyrénées	10.09	9.69	9.27	11.12	10.02	**108**	10.75	9.58	9.38	10.66	10.07	**135**	11.58	10.23	9.38	10.66	10.43	**84**
FR63	Limousin	9.79	9.84	9.07	12.43	10.21	**66**	10.14	9.97	9.09	11.96	10.24	**93**	10.93	11.84	9.09	11.96	10.89	**20**
FR71	Rhône-Alpes	9.82	9.88	9.81	10.01	9.88	**150**	10.33	9.87	9.89	9.95	10.01	**145**	11.16	9.87	9.89	9.95	10.21	**125**
FR72	Auvergne	9.68	10.18	9.16	11.46	10.09	**89**	10.01	10.28	9.17	11.42	10.19	**104**	10.81	11.24	9.17	11.42	10.62	**49**
FR81	Languedoc-Roussillon	10.83	9.11	9.53	11.10	10.11	**86**	11.67	9.04	9.66	10.87	10.26	**90**	12.28	9.65	9.66	10.87	10.56	**55**
FR82	Provence-Alpes-Côte d'Azur	10.59	8.94	9.89	11.03	10.08	**91**	11.41	9.19	9.99	10.83	10.32	**79**	12.03	9.15	9.99	10.83	10.44	**78**
FR83	Corse	10.23	9.07	8.96	11.17	9.82	**174**	11.22	9.07	9.07	11.03	10.04	**140**	12.03	9.07	9.07	11.03	10.22	**121**
GR11	Anatoliki Makedonia, Thraki	11.76	9.51	9.07	9.43	9.89	**145**	12.54	9.20	9.01	9.25	9.90	**180**	12.97	9.45	9.01	9.25	10.06	**162**
GR12	Kentriki Makedonia	12.05	9.14	9.59	9.03	9.88	**148**	12.76	9.29	9.64	9.08	10.09	**128**	13.12	9.41	9.64	9.08	10.20	**126**
GR13	Dytiki Makedonia	10.55	9.82	8.91	9.63	9.71	**205**	11.72	9.20	8.88	9.25	9.70	**226**	12.43	10.33	8.88	9.25	10.13	**145**
GR14	Thessalia	11.71	9.43	9.18	9.62	9.93	**129**	12.59	8.94	9.17	9.32	9.90	**181**	13.00	9.82	9.17	9.32	10.22	**122**
GR21	Ipeiros	11.19	9.72	9.01	10.20	10.00	**113**	12.16	9.75	9.01	9.04	9.91	**177**	12.71	9.65	9.01	9.04	10.00	**180**
GR22	Ionia Nisia	12.54	8.46	9.56	9.99	10.03	**104**	13.10	8.46	9.65	8.90	9.88	**189**	13.30	8.43	9.65	8.90	9.91	**201**
GR23	Dytiki Ellada	11.70	9.19	9.31	9.44	9.86	**159**	12.55	9.34	9.32	8.60	9.85	**197**	12.98	9.41	9.32	8.60	9.95	**193**
GR24	Sterea Ellada	12.12	9.42	8.98	9.85	10.02	**106**	12.77	9.13	8.98	8.38	9.68	**230**	13.10	9.76	8.98	8.38	9.90	**202**
GR25	Peloponnisos	11.96	9.34	9.01	10.43	10.12	**81**	12.70	9.51	9.04	8.66	9.86	**193**	13.08	9.58	9.04	8.66	9.95	**192**
GR30	Attiki	12.95	9.09	11.90	8.78	10.53	**22**	13.31	9.14	11.96	9.69	10.90	**11**	13.46	9.12	11.96	9.69	10.92	**16**
GR41	Voreio Aigaio	12.85	8.80	9.17	10.35	10.18	**72**	13.26	8.96	9.05	9.85	10.15	**114**	13.44	8.73	9.05	9.85	10.11	**150**
GR42	Notio Aigaio	13.15	8.34	9.23	8.62	9.79	**182**	13.38	8.66	9.24	8.60	9.80	**207**	13.48	8.34	9.24	8.60	9.72	**233**
GR43	Kriti	12.63	8.98	9.36	9.13	9.92	**134**	13.13	8.72	9.44	8.52	9.80	**208**	13.36	8.87	9.44	8.52	9.88	**209**
HU10	Közép-Magyarország	10.67	9.71	10.78	9.55	10.16	**76**	11.43	11.07	10.86	9.41	10.66	**25**	11.97	10.73	10.86	9.41	10.70	**36**
HU21	Közép-Dunántúl	10.42	9.57	9.57	9.01	9.63	**216**	11.15	10.33	9.54	9.41	10.08	**131**	11.74	9.96	9.54	9.41	10.12	**149**
HU22	Nyugat-Dunántúl	10.36	9.58	9.49	9.39	9.70	**208**	11.03	10.56	9.47	9.66	10.16	**113**	11.64	10.11	9.47	9.66	10.19	**129**
HU23	Dél-Dunántúl	10.62	9.59	9.32	9.39	9.72	**203**	11.38	10.14	9.25	9.75	10.10	**125**	11.97	10.10	9.25	9.75	10.22	**123**
HU31	Észak-Magyarország	10.31	10.32	9.52	9.34	9.86	**155**	11.02	10.93	9.42	9.61	10.22	**95**	11.60	10.02	9.42	9.61	10.13	**147**
HU32	Észak-Alföld	10.62	10.36	9.47	8.99	9.84	**166**	11.38	10.97	9.40	9.19	10.19	**101**	11.89	10.64	9.40	9.19	10.23	**120**
HU33	Dél-Alföld	10.88	9.70	9.37	9.57	9.86	**154**	11.64	11.09	9.31	9.82	10.42	**58**	12.14	10.84	9.31	9.82	10.47	**68**
IE01	Border, Midlands [...]	9.08	8.51	8.98	8.54	8.78	**261**	9.12	8.52	9.15	8.32	8.77	**261**	9.22	8.67	9.15	8.32	8.83	**261**
IE02	Southern and Eastern	9.08	8.52	9.49	8.10	8.78	**260**	9.13	8.58	9.67	8.04	8.83	**260**	9.27	8.74	9.67	8.04	8.91	**260**

		Baseline period						Scenario period 2011-40						Scenario period 2041-70					
ID	NUTS-2 name	HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	Rank	HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	Rank	HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	Rank
ITC1	Piemonte	10.39	9.00	9.99	11.36	10.15	77	11.29	9.07	9.98	11.22	10.35	74	11.99	9.23	9.98	11.22	10.55	58
ITC2	Valle d'Aosta	9.07	8.46	9.01	10.79	9.30	248	9.23	8.56	9.04	10.65	9.34	249	9.67	8.60	9.04	10.65	9.46	247
ITC3	Liguria	10.34	8.77	10.46	12.41	10.41	36	11.25	9.09	10.43	12.08	10.66	26	12.06	9.15	10.43	12.08	10.86	23
ITC4	Lombardia	11.11	9.00	10.79	10.45	10.31	52	11.81	9.24	10.84	10.40	10.53	42	12.31	9.47	10.84	10.40	10.70	35
ITD1	P. A. Bolzano-Bozen	9.10	8.79	9.31	9.81	9.25	253	9.19	8.90	9.38	9.67	9.28	252	9.54	8.81	9.38	9.67	9.34	250
ITD2	P. A. Trento	9.26	9.06	9.45	10.52	9.56	232	9.56	9.36	9.53	10.25	9.67	232	10.36	9.56	9.53	10.25	9.92	198
ITD3	Veneto	11.45	8.85	10.37	10.52	10.25	59	12.08	9.70	10.40	10.46	10.63	28	12.53	9.77	10.40	10.46	10.74	31
ITD4	Friuli-Venezia Giulia	10.61	9.29	9.92	11.52	10.30	53	11.35	9.70	9.89	11.44	10.56	36	11.92	10.52	9.89	11.44	10.91	19
ITD5	Emilia-Romagna	11.67	9.03	10.08	11.59	10.53	20	12.30	9.19	10.15	10.92	10.58	35	12.75	9.20	10.15	10.92	10.68	39
ITE1	Toscana	10.89	8.91	9.92	11.75	10.31	50	11.81	9.29	9.95	11.31	10.54	41	12.49	9.25	9.95	11.31	10.67	40
ITE2	Umbria	10.76	8.88	9.61	11.82	10.21	67	11.80	9.65	9.67	11.16	10.53	43	12.52	9.65	9.67	11.16	10.68	38
ITE3	Marche	11.27	9.13	9.92	11.57	10.42	34	12.04	9.49	9.97	11.02	10.58	34	12.61	9.26	9.97	11.02	10.64	46
ITE4	Lazio	11.36	8.83	10.53	10.41	10.24	61	12.23	9.22	10.58	10.36	10.54	40	12.75	9.26	10.58	10.36	10.66	41
ITF1	Abruzzo	10.55	9.42	9.72	11.22	10.20	68	11.47	9.80	9.75	10.84	10.44	53	12.17	9.27	9.75	10.84	10.45	77
ITF2	Molise	11.52	9.62	9.37	11.43	10.44	33	12.31	9.94	9.32	11.15	10.62	31	12.82	8.93	9.32	11.15	10.44	79
ITF3	Campania	11.83	9.30	10.82	9.41	10.29	56	12.55	8.96	10.80	9.49	10.36	71	12.97	8.72	10.80	9.49	10.38	95
ITF4	Puglia	12.45	8.81	10.14	9.98	10.27	57	12.93	8.79	10.13	10.26	10.42	59	13.21	8.63	10.13	10.26	10.43	83
ITF5	Basilicata	11.70	9.25	9.26	10.72	10.18	71	12.41	9.36	9.19	10.73	10.35	75	12.87	8.95	9.19	10.73	10.32	102
ITF6	Calabria	12.08	8.94	9.79	10.29	10.21	65	12.65	9.07	9.72	10.44	10.39	68	13.01	8.99	9.72	10.44	10.44	81
ITG1	Sicilia	12.42	8.79	10.08	10.19	10.29	55	12.93	8.84	10.07	10.14	10.39	67	13.22	8.87	10.07	10.14	10.46	75
ITG2	Sardegna	12.04	8.98	9.34	10.04	10.03	105	12.60	9.14	9.32	10.65	10.34	78	13.00	9.05	9.32	10.65	10.40	92
LT00	Lithuania	9.48	10.34	9.19	9.43	9.60	221	9.88	11.83	9.12	9.36	9.99	149	10.16	10.50	9.12	9.36	9.77	227
LU00	Luxembourg	9.53	11.70	10.02	8.98	10.01	112	9.84	11.93	10.22	8.68	10.10	126	10.61	11.37	10.22	8.68	10.17	135
LV00	Latvia	9.36	9.93	8.98	9.44	9.42	244	9.73	11.16	8.91	9.31	9.74	220	9.97	10.28	8.91	9.31	9.60	240
NL11	Groningen	9.33	9.63	10.27	9.54	9.68	209	9.52	9.80	10.26	9.84	9.85	196	9.88	9.03	10.26	9.84	9.74	230
NL12	Friesland (NL)	9.28	9.37	10.06	9.59	9.57	229	9.43	9.63	9.92	10.20	9.79	209	9.72	8.80	9.92	10.20	9.65	238
NL13	Drenthe	9.37	9.65	10.03	9.93	9.74	196	9.55	10.33	10.05	10.53	10.11	124	9.96	10.14	10.05	10.53	10.17	136
NL21	Overijssel	9.42	10.02	10.56	9.32	9.82	173	9.62	10.99	10.60	9.59	10.18	107	10.09	10.94	10.60	9.59	10.29	108
NL22	Gelderland	9.48	11.01	10.73	9.37	10.12	84	9.72	10.49	10.74	9.83	10.19	106	10.20	11.16	10.74	9.83	10.47	70
NL23	Flevoland	9.35	9.80	10.34	7.78	9.27	250	9.55	10.77	10.06	8.14	9.58	240	9.91	9.84	10.06	8.14	9.45	248
NL31	Utrecht	9.43	10.08	11.62	8.92	9.97	119	9.67	10.18	11.74	9.13	10.13	117	10.08	10.77	11.74	9.13	10.39	94
NL32	Noord-Holland	9.35	9.99	11.79	9.25	10.05	99	9.54	9.75	11.56	9.54	10.07	136	9.89	9.20	11.56	9.54	10.01	174
NL33	Zuid-Holland	9.37	10.14	12.10	9.37	10.19	69	9.59	10.23	11.96	9.61	10.30	85	10.06	9.60	11.96	9.61	10.26	117
NL34	Zeeland	9.36	10.51	10.15	10.25	10.06	96	9.58	9.49	10.08	10.88	9.99	148	10.11	9.68	10.08	10.88	10.18	132
NL41	Noord-Brabant	9.46	11.25	10.96	9.23	10.18	70	9.66	10.46	10.95	9.86	10.22	96	10.15	11.03	10.95	9.86	10.49	65
NL42	Limburg (NL)	9.55	11.23	11.02	9.85	10.39	40	9.77	11.29	10.97	10.48	10.61	32	10.40	11.72	10.97	10.48	10.88	22
PL11	Lódzkie	9.71	10.87	9.82	9.61	9.99	114	10.16	11.05	9.74	9.96	10.22	98	10.62	11.17	9.74	9.96	10.36	100
PL12	Mazowieckie	9.71	11.30	9.84	9.50	10.06	95	10.24	11.73	9.86	9.56	10.32	81	10.63	11.96	9.86	9.56	10.46	72
PL21	Malopolskie	9.55	10.67	10.15	9.08	9.85	162	9.89	12.32	10.17	9.28	10.35	72	10.32	10.72	10.17	9.28	10.11	151
PL22	Slaskie	9.59	10.51	10.68	8.97	9.91	138	9.96	11.76	10.60	9.66	10.47	51	10.43	10.76	10.60	9.66	10.36	101
PL31	Lubelskie	9.71	11.16	9.48	9.45	9.92	135	10.23	11.91	9.42	9.64	10.26	91	10.71	11.87	9.42	9.64	10.37	98
PL32	Podkarpackie	9.65	11.33	9.68	8.98	9.87	151	10.04	12.79	9.67	9.20	10.34	77	10.56	11.37	9.67	9.20	10.17	137
PL33	Swietokrzyskie	9.66	10.91	9.63	9.58	9.93	131	10.08	12.03	9.56	9.96	10.36	70	10.55	11.59	9.56	9.96	10.39	93
PL34	Podlaskie	9.60	11.88	9.24	9.54	10.01	110	10.06	11.38	9.20	9.56	10.02	144	10.36	11.14	9.20	9.56	10.04	168
PL41	Wielkopolskie	9.81	11.49	9.66	8.65	9.85	160	10.28	10.97	9.67	9.07	9.97	152	10.72	11.28	9.67	9.07	10.15	141
PL42	Zachodniopomorskie	9.61	10.50	9.38	8.73	9.53	235	9.99	10.62	9.36	9.39	9.83	200	10.41	10.48	9.36	9.39	9.90	204
PL43	Lubuskie	9.90	10.64	9.36	8.61	9.60	220	10.42	11.01	9.34	9.19	9.96	157	10.87	11.00	9.34	9.19	10.07	160
PL51	Dolnoslaskie	9.67	11.02	9.83	9.16	9.90	143	10.06	10.72	9.79	9.66	10.05	139	10.55	11.74	9.79	9.66	10.40	91
PL52	Opolskie	9.68	10.82	9.64	9.08	9.79	181	10.05	10.95	9.59	9.65	10.04	141	10.54	11.43	9.59	9.65	10.27	112
PL61	Kujawsko-Pomorskie	9.73	11.74	9.67	8.78	9.92	136	10.18	10.70	9.65	9.27	9.93	169	10.59	10.94	9.65	9.27	10.09	156
PL62	Warminsko-Mazurskie	9.56	10.65	9.24	8.58	9.48	239	10.01	11.50	9.23	8.98	9.88	187	10.35	11.56	9.23	8.98	9.98	184
PL63	Pomorskie	9.47	10.87	9.70	8.64	9.64	214	9.85	10.60	9.73	9.11	9.81	205	10.25	10.43	9.73	9.11	9.87	212
PT11	Norte	10.62	10.57	9.99	8.65	9.92	137	11.42	9.97	10.03	8.96	10.05	138	12.04	9.94	10.03	8.96	10.18	131
PT15	Algarve	11.79	8.92	9.46	9.68	9.91	139	12.48	8.56	9.65	9.18	9.87	192	12.88	9.70	9.65	9.18	10.26	118
PT16	Centro (PT)	11.05	10.45	9.46	9.98	10.22	64	11.84	9.73	9.51	9.62	10.13	118	12.37	10.41	9.51	9.62	10.42	85
PT17	Lisboa	11.34	9.99	11.75	8.96	10.45	30	12.04	9.19	11.89	9.39	10.54	39	12.52	10.03	11.89	9.39	10.88	21
PT18	Alentejo	11.78	9.95	8.79	10.63	10.23	63	12.42	9.31	8.80	10.06	10.06	137	12.79	9.98	8.80	10.06	10.31	104
RO11	Nord-Vest	9.93	10.52	9.43	8.49	9.56	230	10.59	10.58	9.38	8.62	9.76	218	11.15	10.62	9.38	8.62	9.89	207
RO12	Centru	9.66	9.49	9.38	8.60	9.27	249	10.26	9.80	9.35	8.77	9.53	242	10.88	10.12	9.35	8.77	9.75	229
RO21	Nord-Est	10.17	9.70	9.59	8.71	9.53	236	11.08	10.18	9.55	8.65	9.82	201	11.60	9.79	9.55	8.65	9.84	217
RO22	Sud-Est	11.47	9.02	9.51	8.70	9.62	218	12.27	9.02	9.37	8.94	9.81	204	12.69	9.11	9.37	8.94	9.92	197
RO31	Sud - Muntenia	11.30	9.83	9.56	9.21	9.94	125	12.08	9.08	9.47	9.31	9.92	175	12.52	9.44	9.47	9.31	10.10	153
RO32	Bucuresti - Ilfov	11.68	10.32	12.15	8.85	10.67	12	12.44	8.82	12.06	8.98	10.44	54	12.84	9.29	12.06	8.98	10.66	43
RO41	Sud-Vest Oltenia	10.95	9.97	9.42	9.07	9.83	169	11.83	9.71	9.33	9.19	9.96	158	12.35	9.92	9.33	9.19	10.12	148
RO42	Vest	10.48	10.64	9.26	8.68	9.73	199	11.30	10.72	9.22	8.78	9.95	161	11.86	10.72	9.22	8.78	10.07	158
SE11	Stockholm	9.19	9.90	10.44	9.63	9.78	185	9.59	9.28	10.58	9.31	9.67	231	10.09	9.24	10.58	9.31	9.79	224
SE12	Östra Mellansverige	9.25	10.39	9.02	10.73	9.82	172	9.51	10.15	9.01	10.73	9.83	199	9.85	9.78	9.01	10.73	9.82	219
SE21	Småland med öarna	9.26	10.24	8.79	11.26	9.84	164	9.46	10.40	8.78	11.13	9.90	182	9.79	10.69	8.78	11.13	10.06	161
SE22	Sydsverige	9.20	9.60	9.54	10.79	9.77	192	9.45	9.59	9.64	10.39	9.76	215	9.84	9.72	9.64	10.39	9.89	205
SE23	Västsverige	9.22	10.28	9.27	10.62	9.83	170	9.50	9.81	9.25	10.35	9.72	224	9.85	9.52	9.25	10.35	9.74	231
SE31	Norra Mellansverige	9.20	10.10	8.53	11.50	9.77	188	9.38	9.36	8.49	11.52	9.63	236	9.64	9.82	8.49	11.52	9.81	223
SE32	Mellersta Norrland	9.11	8.47	8.24	11.54	9.26	251	9.17	8.37	8.22	11.42	9.22	254	9.31	8.45	8.22	11.42	9.27	253
SE33	Övre Norrland	9.09	8.39	8.12	10.86	9.06	258	9.17	8.38	8.11	11.05	9.11	257	9.35	8.38	8.11	11.05	9.15	257
SI01	Vzhodna Slovenija	9.81	10.28	9.50	8.95	9.62	217	10.34	10.85	9.48	9.40	10.00	147	11.09	10.77	9.48	9.40	10.16	139
SI02	Zahodna Slovenija	9.78	9.72	9.68	9.13	9.57	228	10.39	10.27	9.70	9.49	9.95	159	11.13	10.87	9.70	9.49	10.27	114
SK01	Bratislavský kraj	10.23	10.34	10.44	8.96	9.97	118	10.90	10.77	10.47	9.33	10.35	73	11.52	10.45	10.47	9.33	10.42	86
SK02	Západné Slovensko	10.15	10.14	9.72	8.92	9.72	202	10.78	11.01	9.70	9.37	10.19	103	11.36	10.78	9.70	9.37	10.27	113
SK03	Stredné Slovensko	9.56	9.88	9.45	8.72	9.39	245	9.98	11.57	9.43	9.00	9.95	162	10.53	10.82	9.43	9.00	9.92	199
SK04	Východné Slovensko	9.65	11.49	9.57	8.38	9.71	204	10.06	11.83	9.58	8.57	9.94	165	10.57	11.11	9.58	8.57	9.91	200

		Baseline period						Scenario period 2011-40						Scenario period 2041-70					
ID	**NUTS-2 name**	HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	**Rank**	HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	**Rank**	HE_TCOMB	HE_HDWI	HS_POPD	HS_PCOMB	H_Impact	**Rank**
UKC1	Tees Valley and Durham	9.09	8.41	10.70	10.27	9.57	**227**	9.11	8.54	10.79	10.08	9.59	**239**	9.21	8.47	10.79	10.08	9.60	**241**
UKC2	Northumberland, […]	9.08	8.34	10.29	10.56	9.52	**237**	9.10	8.34	10.34	10.24	9.47	**248**	9.14	8.34	10.34	10.24	9.48	**246**
UKD1	Cumbria	9.10	8.37	9.37	11.14	9.44	**243**	9.12	8.40	9.41	11.29	9.50	**245**	9.17	8.37	9.41	11.29	9.50	**244**
UKD2	Cheshire	9.18	8.94	10.81	10.36	9.79	**178**	9.26	9.28	10.90	10.40	9.94	**167**	9.43	9.36	10.90	10.40	10.00	**176**
UKD3	Greater Manchester	9.14	8.61	12.87	9.78	9.97	**116**	9.20	8.72	13.05	9.29	9.93	**168**	9.33	8.75	13.05	9.29	9.98	**186**
UKD4	Lancashire	9.10	8.39	10.91	10.42	9.65	**212**	9.15	8.52	11.02	10.23	9.68	**229**	9.25	8.43	11.02	10.23	9.68	**236**
UKD5	Merseyside	9.16	8.66	12.94	10.46	10.18	**73**	9.25	9.87	12.95	10.13	10.46	**52**	9.46	8.98	12.95	10.13	10.28	**111**
UKE1	East Yorkshire […]	9.17	8.40	10.31	10.52	9.56	**231**	9.26	8.63	10.43	10.36	9.64	**235**	9.49	9.38	10.43	10.36	9.90	**203**
UKE2	North Yorkshire	9.11	8.42	9.54	10.94	9.46	**241**	9.15	8.63	9.63	10.74	9.51	**244**	9.28	8.91	9.63	10.74	9.62	**239**
UKE3	South Yorkshire	9.19	8.62	11.58	10.22	9.84	**165**	9.27	8.64	11.74	9.73	9.78	**210**	9.45	9.35	11.74	9.73	10.02	**172**
UKE4	West Yorkshire	9.12	8.47	11.92	9.81	9.75	**195**	9.17	8.34	12.18	9.16	9.61	**238**	9.28	8.81	12.18	9.16	9.77	**226**
UKF1	Derbyshire […]	9.20	9.26	10.81	10.32	9.87	**152**	9.28	8.98	10.95	9.96	9.77	**213**	9.48	9.60	10.95	9.96	9.98	**182**
UKF2	Leicestershire, […]	9.25	9.45	10.56	9.86	9.77	**190**	9.40	9.53	10.73	9.62	9.81	**206**	9.63	9.56	10.73	9.62	9.87	**210**
UKF3	Lincolnshire	9.20	8.84	9.68	11.26	9.70	**206**	9.32	9.24	9.81	11.25	9.88	**190**	9.59	9.58	9.81	11.25	10.04	**170**
UKG1	Herefordshire, […]	9.24	9.64	10.15	10.73	9.93	**133**	9.39	9.47	10.25	10.85	9.97	**154**	9.62	8.96	10.25	10.85	9.89	**206**
UKG2	Shropshire […]	9.19	9.62	10.27	10.42	9.86	**156**	9.28	9.39	10.34	10.62	9.89	**185**	9.45	9.00	10.34	10.62	9.83	**218**
UKG3	West Midlands	9.22	10.13	13.51	10.06	10.61	**13**	9.35	9.13	13.58	9.28	10.18	**108**	9.55	9.34	13.58	9.28	10.30	**106**
UKH1	East Anglia	9.24	9.23	10.02	10.90	9.82	**171**	9.39	9.36	10.17	10.77	9.90	**179**	9.66	9.55	10.17	10.77	10.02	**171**
UKH2	Bedfordshire, Hertfordshire	9.30	9.35	11.13	9.85	9.89	**146**	9.50	9.69	11.29	9.52	9.97	**153**	9.78	9.25	11.29	9.52	9.93	**196**
UKH3	Essex	9.29	9.63	10.88	10.56	10.07	**92**	9.51	9.18	11.05	10.23	9.97	**156**	9.86	9.12	11.05	10.23	10.04	**166**
UKI1	Inner London	9.35	9.84	13.58	8.21	10.06	**94**	9.55	10.16	13.58	8.16	10.18	**109**	9.86	9.73	13.58	8.16	10.15	**140**
UKI2	Outer London	9.36	9.90	13.58	9.44	10.44	**32**	9.55	10.00	13.58	8.75	10.32	**80**	9.87	10.12	13.58	8.75	10.44	**82**
UKJ1	Berkshire, […]	9.32	9.62	10.68	9.56	9.78	**183**	9.51	10.10	10.82	9.38	9.94	**166**	9.80	9.33	10.82	9.38	9.82	**222**
UKJ2	Surrey, East and West Sussex	9.29	9.24	10.94	11.21	10.13	**80**	9.45	9.61	11.08	10.74	10.19	**100**	9.80	9.24	11.08	10.74	10.19	**128**
UKJ3	Hampshire and Isle of Wight	9.29	9.58	10.85	10.55	10.04	**100**	9.49	9.67	10.99	10.32	10.10	**127**	9.86	9.66	10.99	10.32	10.19	**127**
UKJ4	Kent	9.25	9.17	10.84	10.45	9.90	**142**	9.45	9.15	10.99	10.23	9.93	**170**	9.79	8.85	10.99	10.23	9.93	**195**
UKK1	Gloucestershire, […]	9.26	10.05	10.47	10.43	10.04	**101**	9.44	10.27	10.62	10.03	10.08	**133**	9.73	9.51	10.62	10.03	9.96	**189**
UKK2	Dorset and Somerset	9.23	10.02	10.10	12.08	10.31	**51**	9.40	9.28	10.21	11.81	10.13	**119**	9.68	9.18	10.21	11.81	10.18	**133**
UKK3	Cornwall and Isles of Scilly	9.08	8.75	9.86	11.59	9.76	**193**	9.26	8.63	10.00	11.36	9.76	**216**	9.54	9.18	10.00	11.36	9.99	**181**
UKK4	Devon	9.13	9.68	9.96	11.59	10.05	**98**	9.27	9.12	10.10	11.18	9.88	**186**	9.44	9.20	10.10	11.18	9.95	**191**
UKL1	West Wales and The Valleys	9.10	8.49	9.83	10.97	9.56	**233**	9.17	8.48	9.91	10.78	9.55	**241**	9.28	8.43	9.91	10.78	9.56	**242**
UKL2	East Wales	9.13	9.04	9.82	10.39	9.58	**224**	9.22	8.89	9.92	10.08	9.51	**243**	9.36	8.69	9.92	10.08	9.50	**245**
UKM2	Eastern Scotland	9.08	8.34	9.63	10.25	9.30	**247**	9.10	8.34	9.73	9.92	9.25	**253**	9.13	8.34	9.73	9.92	9.26	**254**
UKM3	South Western Scotland	9.09	8.36	9.98	10.15	9.36	**246**	9.11	8.37	10.03	9.85	9.31	**250**	9.15	8.36	10.03	9.85	9.32	**251**
UKM5	North Eastern Scotland	9.06	8.34	9.26	9.99	9.15	**254**	9.07	8.34	9.41	9.62	9.10	**258**	9.09	8.34	9.41	9.62	9.10	**259**
UKM6	Highlands and Islands	9.06	8.34	8.48	10.82	9.13	**256**	9.07	8.34	8.48	11.03	9.17	**256**	9.09	8.34	8.48	11.03	9.18	**256**
UKN0	Northern Ireland	9.07	8.34	9.72	9.47	9.13	**255**	9.09	8.34	9.85	9.16	9.10	**259**	9.16	8.34	9.85	9.16	9.11	**258**

Table B.2: River flood risk – normalised (shifted by 10) individual input parameters as well as final indicator for baseline period, scenario period 2011-40 and scenario period 2041-70, for each NUTS-2 region. Furthermore, the NUTS-2 ranking is given (1 = highest impact, 256 = lowest impact; light grey = regions within 4th quartile of baseline; dark grey = regions additionally within the 1st quartile of adaptive capacity, i.e. vulnerability hotspot regions).

		Baseline period						Scenario period 2011-40						Scenario period 2041-70					
ID	NUTS-2 name	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	Rank	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	Rank	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	Rank
AT11	Burgenland (A)	10.59	10.12	9.21	10.35	10.06	100	10.63	10.07	9.22	10.42	10.07	109	10.48	10.15	9.21	10.42	10.05	117
AT12	Niederösterreich	10.25	10.93	9.76	11.50	10.59	41	10.27	10.96	9.79	11.57	10.63	40	10.26	10.85	9.78	11.54	10.59	49
AT13	Wien	10.09	10.50	13.25	9.61	10.78	29	10.09	10.57	13.35	9.61	10.81	28	10.09	10.47	13.45	9.61	10.81	31
AT21	Kärnten	9.56	10.86	9.76	11.57	10.40	57	9.62	12.17	9.80	11.87	10.80	29	9.60	11.75	9.79	11.87	10.70	40
AT22	Steiermark	9.59	11.09	10.42	11.92	10.72	33	9.65	11.65	10.38	12.07	10.89	26	9.64	11.59	10.39	12.09	10.89	28
AT31	Oberösterreich	9.58	10.18	10.16	10.50	10.10	95	9.60	10.51	10.23	10.57	10.22	89	9.57	10.20	10.15	10.49	10.10	108
AT32	Salzburg	9.35	9.52	11.50	13.40	10.82	27	9.38	9.77	11.69	13.41	10.95	24	9.37	9.69	11.46	13.40	10.87	30
AT33	Tirol	9.39	10.19	11.15	13.41	10.94	21	9.40	10.56	11.15	13.41	11.04	19	9.40	10.64	11.30	13.41	11.10	19
AT34	Vorarlberg	9.50	10.73	10.91	12.02	10.75	30	9.50	10.82	10.91	12.07	10.79	31	9.50	10.68	10.91	12.07	10.75	36
BE10	Région de Bruxelles	9.95	9.54	13.25	11.26	10.91	22	10.30	9.43	13.35	12.15	11.20	13	10.52	9.63	13.45	12.73	11.47	8
BE21	Prov. Antwerpen	10.50	9.38	10.35	9.25	9.86	137	10.66	9.44	10.43	9.47	9.98	120	10.80	9.87	10.65	9.65	10.23	95
BE22	Prov. Limburg (B)	9.67	10.68	10.14	9.12	9.88	129	9.64	10.98	10.15	9.11	9.95	129	9.71	10.76	10.19	9.12	9.93	136
BE23	Prov. Oost-Vlaanderen	10.74	10.22	11.04	10.66	10.66	37	10.91	10.37	11.05	10.89	10.80	30	11.11	10.24	11.21	11.18	10.93	26
BE24	Prov. Vlaams Brabant	9.98	9.78	10.43	11.10	10.31	72	10.02	9.71	10.46	11.35	10.37	73	10.27	9.81	10.68	11.91	10.64	45
BE25	Prov. West-Vlaanderen	10.45	9.37	9.33	9.49	9.65	177	10.46	9.73	9.33	9.50	9.75	166	10.84	9.33	9.36	9.77	9.81	156
BE31	Prov. Brabant Wallon	9.18	9.05	11.56	10.35	9.98	113	9.18	9.18	11.56	10.34	10.02	116	9.18	9.64	11.56	10.34	10.14	102
BE32	Prov. Hainaut	9.46	9.71	10.43	10.34	9.98	115	9.54	9.69	10.49	10.50	10.04	113	9.54	9.67	10.50	10.53	10.05	116
BE33	Prov. Liège	9.45	10.98	13.20	11.33	11.16	11	9.47	11.01	13.35	11.65	11.28	12	9.48	10.89	13.45	11.76	11.30	12
BE34	Prov. Luxembourg (B)	9.27	9.72	9.47	8.96	9.35	216	9.27	9.72	9.47	8.96	9.35	218	9.27	9.73	9.48	9.03	9.37	217
BE35	Prov. Namur	9.35	10.85	10.74	11.07	10.48	46	9.35	10.92	10.74	11.09	10.50	51	9.35	10.85	10.74	11.21	10.51	57
BG31	Severozapaden	10.59	11.18	9.25	10.64	10.39	59	10.56	11.21	9.24	10.57	10.37	71	10.48	11.10	9.24	10.47	10.30	81
BG32	Severen tsentralen	10.39	12.50	9.28	10.62	10.63	38	10.31	11.93	9.27	10.47	10.45	57	10.25	11.53	9.25	10.32	10.31	78
BG33	Severoiztochen	9.14	9.68	9.23	9.06	9.27	225	9.13	9.36	9.24	9.06	9.20	238	9.13	8.82	9.24	9.06	9.06	246
BG34	Yugoiztochen	9.58	11.29	9.40	9.71	9.97	118	9.56	10.88	9.30	9.60	9.81	147	9.50	10.46	9.31	9.60	9.71	171
BG41	Yugozapaden	9.38	10.07	9.53	9.58	9.64	181	9.42	10.54	9.55	9.64	9.78	157	9.39	10.20	9.52	9.54	9.66	183
BG42	Yuzhen tsentralen	9.74	10.94	9.53	10.48	10.16	88	9.78	11.31	9.55	10.55	10.27	82	9.59	9.89	9.40	10.09	9.74	168
CZ01	Praha	10.24	13.08	13.25	9.72	11.46	8	10.27	13.52	13.31	9.75	11.59	6	10.39	14.38	13.45	9.99	11.90	4
CZ02	Stredni Cechy	10.18	11.70	9.76	10.45	10.50	44	10.19	11.66	9.77	10.50	10.51	50	10.25	12.21	9.79	10.68	10.69	41
CZ03	Jihozápad	9.40	9.94	9.99	10.14	9.86	135	9.41	10.00	10.01	10.20	9.90	137	9.43	10.32	10.04	10.35	10.03	119
CZ04	Severozápad	9.58	11.86	10.04	10.34	10.42	51	9.59	11.88	10.04	10.35	10.43	64	9.66	12.86	10.05	10.67	10.74	37
CZ05	Severovýchod	9.70	10.47	10.26	10.92	10.33	66	9.71	10.40	10.26	10.94	10.32	76	9.72	10.49	10.24	10.95	10.34	75
CZ06	Jihovýchod	10.04	11.81	10.03	10.70	10.62	39	10.03	11.73	10.04	10.71	10.60	43	9.99	11.50	9.98	10.41	10.45	61
CZ07	Stredni Morava	10.21	10.70	10.14	11.30	10.58	42	10.25	10.64	10.11	11.30	10.57	47	10.19	10.69	10.15	11.25	10.56	53
CZ08	Moravskoslezsko	9.75	10.47	10.79	10.25	10.31	71	9.81	10.73	10.79	10.33	10.41	67	9.84	10.83	10.82	10.42	10.47	60
DE11	Stuttgart	9.42	9.94	12.45	11.44	10.75	31	9.42	9.92	12.45	11.42	10.74	34	9.45	10.10	12.67	11.81	10.93	25
DE12	Karlsruhe	9.87	11.47	11.27	9.75	10.56	43	9.88	11.45	11.32	9.83	10.59	45	9.95	11.49	11.30	9.95	10.65	44
DE13	Freiburg	9.55	10.67	10.65	10.20	10.26	78	9.56	10.56	10.62	10.19	10.22	90	9.55	10.64	10.63	10.21	10.25	92
DE14	Tübingen	9.56	9.89	10.23	11.57	10.29	74	9.55	9.77	10.26	11.67	10.28	81	9.57	9.88	10.23	11.67	10.31	79
DE21	Oberbayern	10.03	10.39	10.90	10.20	10.38	62	10.07	10.48	10.95	10.26	10.43	61	10.02	10.46	10.91	10.19	10.39	70
DE22	Niederbayern	10.17	10.64	9.68	10.20	10.17	85	10.20	10.81	9.70	10.21	10.22	91	10.18	10.81	9.68	10.28	10.23	96
DE23	Oberpfalz	9.65	9.36	9.79	9.45	9.56	189	9.65	9.32	9.78	9.43	9.54	195	9.63	9.44	9.78	9.39	9.56	194
DE24	Oberfranken	9.42	9.11	9.90	10.61	9.74	153	9.42	9.16	9.90	10.61	9.76	162	9.44	9.13	9.88	10.61	9.75	167
DE25	Mittelfranken	9.36	8.58	10.14	9.05	9.26	228	9.35	8.64	10.15	9.05	9.28	230	9.35	8.62	10.15	9.05	9.28	229
DE26	Unterfranken	9.62	11.00	10.39	10.67	10.41	56	9.60	11.03	10.39	10.56	10.38	70	9.63	11.10	10.41	10.72	10.45	62
DE27	Schwaben	10.24	10.27	10.19	11.02	10.43	50	10.24	10.28	10.20	11.01	10.43	65	10.21	10.43	10.15	10.92	10.42	66
DE30	Berlin	10.18	12.16	13.25	11.03	11.60	6	10.18	11.72	13.35	11.03	11.52	8	10.26	12.15	13.45	11.09	11.68	6
DE41	Brandenburg - Nordost	11.16	11.35	9.42	11.13	10.74	32	10.97	11.20	9.45	11.09	10.65	38	11.12	11.66	9.42	11.08	10.79	32
DE42	Brandenburg - Südwest	12.24	11.01	9.54	10.69	10.83	26	11.97	10.61	9.50	10.37	10.57	46	12.37	11.05	9.56	10.79	10.90	27
DE50	Bremen	13.33	12.67	10.96	12.82	12.41	1	13.49	12.86	10.96	12.83	12.50	1	13.61	13.15	11.00	12.86	12.61	2
DE60	Hamburg	13.33	11.56	12.20	12.31	12.34	2	13.49	11.04	11.96	11.56	11.98	3	13.61	12.58	12.46	13.11	12.93	1
DE71	Darmstadt	10.31	11.55	11.51	10.54	10.96	19	10.30	11.57	11.51	10.52	10.96	23	10.37	11.92	11.49	10.63	11.08	20
DE72	Gießen	9.39	9.04	10.82	9.84	9.75	152	9.39	8.78	10.83	9.85	9.68	175	9.41	9.03	10.87	9.91	9.78	160
DE73	Kassel	9.49	8.93	9.81	9.38	9.40	205	9.47	8.74	9.83	9.35	9.34	220	9.51	9.06	9.80	9.39	9.44	209
DE80	Mecklenburg-Vorpommern	9.79	9.68	9.28	9.32	9.52	193	9.81	9.68	9.27	9.32	9.52	197	9.83	9.92	9.29	9.35	9.59	189
DE91	Braunschweig	9.79	9.26	9.78	9.49	9.58	187	9.86	9.16	9.80	9.52	9.58	191	9.83	9.09	9.78	9.52	9.55	195
DE92	Hannover	10.75	10.46	9.61	9.95	10.19	82	10.75	10.35	9.61	9.96	10.16	99	10.81	10.71	9.62	9.98	10.27	90
DE93	Lüneburg	12.91	11.29	9.31	10.04	10.80	28	12.93	11.48	9.32	9.97	10.84	27	13.32	11.56	9.32	10.25	11.01	22
DE94	Weser-Ems	11.98	9.89	9.37	10.00	10.26	77	12.30	9.75	9.36	9.99	10.29	77	12.05	9.90	9.37	9.99	10.28	86
DEA1	Düsseldorf	10.79	11.13	10.21	9.34	10.35	65	10.77	11.38	10.30	9.37	10.43	62	10.90	11.85	10.10	9.33	10.50	58
DEA2	Köln	9.58	10.29	11.24	9.34	10.09	97	9.59	10.39	11.32	9.37	10.14	101	9.62	10.80	11.35	9.39	10.26	91
DEA3	Münster	9.61	9.72	9.95	9.49	9.69	168	9.64	9.53	9.98	9.58	9.68	176	9.65	9.49	9.97	9.58	9.67	181
DEA4	Detmold	9.70	10.30	10.26	9.48	9.93	122	9.71	10.19	10.29	9.49	9.91	134	9.76	10.70	10.30	9.54	10.07	113
DEA5	Arnsberg	9.42	9.09	11.33	9.72	9.85	139	9.47	9.12	11.34	9.83	9.91	136	9.47	9.15	11.28	9.77	9.88	144
DEB1	Koblenz	9.42	10.82	11.54	9.62	10.31	69	9.42	10.95	11.57	9.65	10.36	74	9.44	11.56	11.74	9.77	10.58	52
DEB2	Trier	9.35	9.47	10.41	10.25	9.86	136	9.34	9.30	10.41	10.20	9.80	150	9.35	9.43	10.42	10.24	9.85	148
DEB3	Rheinhessen-Pfalz	9.84	11.23	10.83	9.97	10.45	49	9.87	11.14	10.78	10.11	10.47	55	9.96	11.51	10.75	10.18	10.58	51
DEC0	Saarland	9.45	9.68	11.21	9.82	10.02	108	9.45	9.68	11.34	9.88	10.06	111	9.45	9.62	11.21	9.82	10.00	124
DED1	Chemnitz	9.22	8.57	11.77	9.79	9.77	149	9.22	8.56	11.77	9.79	9.77	159	9.25	8.60	11.89	9.92	9.84	149
DED2	Dresden	9.55	10.01	10.71	9.44	9.91	125	9.55	9.92	10.71	9.44	9.89	139	9.60	10.67	10.91	9.57	10.17	101
DED3	Leipzig	10.57	10.60	10.21	9.76	10.28	76	10.53	10.44	10.22	9.72	10.22	88	11.08	11.42	10.19	10.03	10.66	42

		Baseline period						Scenario period 2011-40						Scenario period 2041-70					
ID	NUTS-2 name	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	Rank	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	Rank	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	Rank
DEE0	Sachsen-Anhalt	11.59	10.85	9.41	9.51	10.30	73	11.30	10.58	9.40	9.35	10.13	103	11.89	11.64	9.40	9.69	10.60	47
DEF0	Schleswig-Holstein	10.42	10.25	9.34	9.29	9.81	143	10.68	10.02	9.30	9.22	9.79	152	10.90	10.03	9.30	9.38	9.88	145
DEG0	Thüringen	9.68	10.28	10.40	10.09	10.11	93	9.67	10.04	10.40	10.06	10.04	114	9.68	10.23	10.39	10.07	10.09	111
DK01	Hovedstaden	9.03	9.00	8.97	8.88	8.97	251	9.03	9.00	8.97	8.88	8.97	250	9.03	9.00	8.97	8.88	8.97	252
DK02	Sjælland	9.12	8.49	9.32	9.04	8.99	250	9.12	9.06	9.32	9.04	9.14	245	9.12	9.07	9.32	9.04	9.14	241
DK03	Syddanmark	9.39	8.88	9.26	8.93	9.11	242	9.50	8.90	9.25	8.96	9.15	244	9.40	9.01	9.26	8.93	9.15	240
DK04	Midtjylland	9.28	8.68	9.17	9.02	9.03	245	9.30	9.18	9.17	9.07	9.18	241	9.30	8.99	9.17	9.07	9.13	242
DK05	Nordjylland	9.15	8.08	8.97	8.88	8.76	254	9.15	8.26	8.97	8.88	8.81	254	9.15	8.25	8.97	8.88	8.80	253
EE00	Estonia	9.61	9.65	9.08	9.36	9.42	201	9.74	9.84	9.08	9.49	9.53	196	9.65	9.63	9.09	9.40	9.44	208
ES11	Galicia	9.17	9.25	9.51	8.93	9.21	232	9.19	9.51	9.54	8.97	9.30	225	9.17	9.38	9.55	8.96	9.26	231
ES12	Principado de Asturias	9.15	8.65	11.07	10.43	9.78	147	9.15	8.72	11.04	10.42	9.79	151	9.15	8.36	11.07	10.42	9.69	174
ES13	Cantabria	9.13	8.76	8.97	9.59	9.11	243	9.13	9.21	8.97	9.59	9.22	236	9.13	9.03	8.97	9.59	9.18	238
ES21	Pais Vasco	9.21	9.50	13.25	10.01	10.38	61	9.23	9.59	13.35	10.08	10.45	59	9.22	9.55	13.45	10.06	10.45	64
ES22	Comunidad Foral de Navarra	9.68	10.34	9.67	9.84	9.88	130	9.73	10.51	9.55	9.78	9.89	140	9.71	10.26	9.57	9.78	9.83	152
ES23	La Rioja	9.58	10.51	9.54	9.88	9.87	132	9.60	10.76	9.53	9.88	9.93	131	9.59	10.85	9.52	9.88	9.95	131
ES24	Aragón	9.39	10.15	9.41	9.24	9.54	190	9.40	10.11	9.57	9.42	9.62	184	9.39	10.13	9.42	9.25	9.54	197
ES30	Comunidad de Madrid	9.67	10.11	10.07	9.15	9.74	157	9.69	10.24	10.05	9.16	9.78	156	9.66	10.25	10.08	9.15	9.77	162
ES41	Castilla y León	9.51	10.06	9.39	9.87	9.70	165	9.50	10.02	9.37	9.82	9.67	178	9.50	9.97	9.37	9.81	9.66	182
ES42	Castilla-la Mancha	9.46	9.60	9.16	9.25	9.37	212	9.44	9.59	9.15	9.23	9.35	217	9.48	9.79	9.16	9.28	9.42	211
ES43	Extremadura	9.41	10.28	9.12	9.23	9.50	194	9.43	10.61	9.12	9.23	9.58	190	9.47	11.02	9.13	9.35	9.71	170
ES51	Cataluña	9.32	10.21	9.68	9.21	9.60	186	9.31	10.13	9.67	9.21	9.57	192	9.29	9.76	9.70	9.19	9.48	200
ES52	Comunidad Valenciana	9.42	10.46	10.25	9.23	9.82	141	9.38	9.72	10.19	9.17	9.61	186	9.44	10.60	10.14	9.20	9.83	151
ES53	Illes Balears	9.09	8.12	9.06	8.88	8.78	253	9.04	8.33	9.10	8.88	8.83	253	9.09	8.07	9.06	8.88	8.77	254
ES61	Andalucia	9.71	10.53	9.35	9.43	9.74	156	9.75	10.90	9.23	9.36	9.79	153	9.83	11.69	9.40	9.65	10.10	107
ES62	Región de Murcia	9.42	9.97	9.78	9.42	9.64	179	9.37	9.36	9.86	9.38	9.49	203	9.45	10.45	10.00	9.60	9.87	147
FI13	Itä-Suomi	9.63	8.81	9.05	10.23	9.41	202	9.62	8.91	9.05	10.21	9.44	209	9.59	8.78	9.05	10.19	9.39	216
FI18	Etelä-Suomi	9.45	8.89	9.24	9.36	9.23	231	9.44	8.91	9.25	9.36	9.24	234	9.44	8.91	9.25	9.36	9.24	235
FI19	Länsi-Suomi	9.64	8.48	9.20	10.24	9.37	211	9.67	8.58	9.21	10.37	9.44	208	9.65	8.46	9.20	10.23	9.36	219
FI1A	Pohjois-Suomi	9.70	8.66	9.04	9.73	9.27	226	9.70	8.70	9.04	9.75	9.29	229	9.70	8.71	9.04	9.85	9.31	223
FR10	Île de France	9.97	10.98	13.25	10.34	11.07	13	9.94	11.28	13.35	10.34	11.15	15	9.91	10.66	13.45	10.26	10.99	24
FR21	Champagne-Ardenne	9.92	10.28	9.59	10.32	10.02	106	9.89	10.18	9.58	10.26	9.98	123	9.87	10.01	9.60	10.29	9.94	133
FR22	Picardie	9.69	9.81	10.08	11.13	10.16	87	9.72	9.85	10.08	11.21	10.20	93	9.66	9.71	10.09	11.09	10.12	106
FR23	Haute-Normandie	9.76	10.75	9.87	10.24	10.15	89	9.88	10.73	9.83	11.15	10.38	69	9.74	10.31	9.87	10.15	10.01	121
FR24	Centre	9.77	10.42	9.55	9.66	9.84	140	9.84	10.75	9.56	9.80	9.98	122	9.80	10.51	9.56	9.72	9.89	143
FR25	Basse-Normandie	9.47	8.98	9.36	9.44	9.31	219	9.47	9.14	9.36	9.44	9.35	216	9.48	9.01	9.35	9.44	9.32	221
FR26	Bourgogne	9.81	9.80	9.33	10.36	9.82	142	9.89	10.04	9.33	10.47	9.92	132	9.85	10.02	9.33	10.41	9.89	141
FR30	Nord - Pas-de-Calais	10.23	9.63	10.09	10.09	10.01	110	10.28	9.75	10.10	10.14	10.06	110	10.27	9.82	10.09	10.12	10.07	112
FR41	Lorraine	9.66	10.30	9.89	10.08	9.98	114	9.66	10.27	9.88	10.09	9.97	124	9.67	10.37	9.90	10.09	10.00	123
FR42	Alsace	10.14	10.13	10.54	10.14	10.24	79	10.14	10.24	10.54	10.14	10.26	84	10.14	10.26	10.54	10.14	10.27	89
FR43	Franche-Comté	9.76	9.97	9.58	10.96	10.06	99	9.80	10.54	9.60	11.10	10.24	85	9.78	10.08	9.58	10.99	10.10	110
FR51	Pays de la Loire	10.00	10.33	9.37	9.36	9.76	150	10.12	11.26	9.43	9.62	10.08	108	10.03	10.45	9.39	9.40	9.81	157
FR52	Bretagne	9.22	8.88	9.78	9.20	9.27	227	9.23	9.13	9.77	9.21	9.33	221	9.23	9.12	9.76	9.21	9.33	220
FR53	Poitou-Charentes	9.65	9.18	9.26	9.34	9.36	213	9.70	9.61	9.28	9.44	9.51	199	9.70	9.45	9.26	9.37	9.44	207
FR61	Aquitaine	9.70	10.05	9.40	10.06	9.80	144	9.80	10.31	9.40	10.17	9.91	135	9.68	10.00	9.35	9.73	9.69	176
FR62	Midi-Pyrénées	9.58	9.75	9.48	9.73	9.63	182	9.59	9.81	9.48	9.75	9.66	182	9.57	9.59	9.49	9.72	9.59	190
FR63	Limousin	9.18	8.63	9.62	9.74	9.28	224	9.19	9.04	9.61	9.79	9.40	212	9.18	8.70	9.62	9.75	9.30	226
FR71	Rhône-Alpes	9.40	9.73	9.90	9.84	9.71	164	9.42	9.96	9.91	9.91	9.80	148	9.42	9.87	9.91	9.88	9.77	163
FR72	Auvergne	9.41	9.75	9.25	9.40	9.45	199	9.43	9.93	9.25	9.43	9.51	200	9.43	10.07	9.26	9.44	9.54	196
FR81	Languedoc-Roussillon	9.66	10.18	9.35	9.25	9.60	185	9.66	10.09	9.35	9.26	9.58	189	9.64	10.32	9.36	9.27	9.64	184
FR82	Provence-Alpes-Côte d'Azur	9.52	10.13	9.50	9.49	9.66	175	9.54	10.54	9.52	9.54	9.77	158	9.61	10.36	9.52	9.70	9.79	158
FR83	Corse	9.10	9.46	9.17	8.93	9.16	237	9.10	9.57	9.17	8.91	9.19	240	9.10	9.82	9.17	8.91	9.24	234
GR11	Anatoliki Makedonia, Thraki	10.24	12.69	9.09	8.99	10.15	90	10.32	13.27	9.09	9.00	10.29	78	10.17	11.94	9.08	9.00	9.98	128
GR12	Kentriki Makedonia	10.37	11.05	9.18	8.97	9.86	138	10.49	11.41	9.19	8.97	9.97	126	10.46	11.33	9.19	8.97	9.94	132
GR13	Dytiki Makedonia	9.22	9.30	9.13	8.95	9.15	239	9.21	9.61	9.12	8.96	9.22	237	9.23	9.10	9.11	8.96	9.10	243
GR14	Thessalia	9.95	10.03	9.36	9.80	9.78	146	10.08	10.05	9.34	9.90	9.84	145	10.11	9.84	9.31	9.99	9.81	155
GR21	Ipeiros	9.40	9.94	9.26	9.35	9.48	196	9.41	10.07	9.26	9.35	9.52	198	9.38	9.95	9.26	9.32	9.48	201
GR23	Dytiki Ellada	9.39	10.17	9.22	9.20	9.49	195	9.41	10.48	9.23	9.21	9.57	193	9.38	10.03	9.23	9.20	9.45	204
GR24	Sterea Ellada	9.21	10.13	9.16	8.88	9.33	217	9.23	10.31	9.16	8.88	9.38	214	9.22	10.03	9.16	8.88	9.31	224
GR25	Peloponnisos	9.14	9.19	9.17	9.00	9.13	241	9.18	9.22	9.24	9.02	9.16	242	9.14	8.76	9.17	9.00	9.02	250
GR30	Attiki	9.01	7.87	8.97	8.88	8.67	256	9.01	7.61	8.97	8.88	8.60	256	9.01	7.20	8.97	8.88	8.48	256
GR43	Kriti	9.03	8.96	9.21	8.88	9.02	247	9.03	8.73	9.21	8.88	8.96	251	9.03	8.82	9.21	8.88	8.98	251
HU10	Közép-Magyarország	11.71	9.99	9.30	9.07	9.97	117	12.02	9.90	9.29	9.08	10.01	117	11.37	9.47	9.29	9.06	9.76	164
HU21	Közép-Dunántúl	10.53	10.57	9.21	9.45	9.92	124	10.48	10.37	9.21	9.38	9.84	144	10.38	10.05	9.21	9.40	9.75	166
HU22	Nyugat-Dunántúl	13.22	11.51	9.51	13.41	11.80	4	13.10	11.50	9.52	13.41	11.78	4	12.78	11.32	9.52	13.41	11.66	7
HU23	Dél-Dunántúl	11.96	11.27	9.16	10.24	10.60	40	11.87	11.43	9.15	9.97	10.55	48	11.88	11.28	9.16	10.08	10.55	54
HU31	Észak-Magyarország	13.33	11.68	9.30	12.96	11.71	5	13.49	11.71	9.31	12.88	11.72	5	13.31	11.92	9.28	12.66	11.68	5
HU32	Észak-Alföld	13.33	11.59	9.19	12.72	11.59	7	13.49	11.48	9.19	12.46	11.54	7	13.61	11.36	9.18	12.02	11.43	9
HU33	Dél-Alföld	13.33	11.41	9.20	11.91	11.36	9	13.49	11.37	9.21	12.05	11.42	10	13.61	11.14	9.21	11.69	11.30	13
IE01	Border, Midlands […]	9.39	9.16	9.21	9.41	9.29	221	9.44	9.45	9.21	9.53	9.41	210	9.44	9.45	9.21	9.53	9.41	214
IE02	Southern and Eastern	9.32	9.06	9.57	9.22	9.29	222	9.33	9.19	9.58	9.23	9.33	222	9.35	9.48	9.57	9.27	9.42	212
ITC1	Piemonte	9.82	11.09	9.93	9.73	10.13	91	9.82	10.76	9.94	9.72	10.05	112	9.94	11.67	9.98	9.88	10.34	76
ITC2	Valle d'Aosta	9.16	8.93	10.61	13.41	10.39	60	9.14	8.84	10.58	13.01	10.27	83	9.16	9.10	10.58	13.41	10.43	65
ITC3	Liguria	9.15	11.85	10.25	9.36	10.10	96	9.17	13.40	10.70	9.57	10.59	44	9.18	13.57	10.94	9.70	10.72	39
ITC4	Lombardia	10.57	10.80	9.96	9.46	10.18	83	10.83	11.32	10.01	9.60	10.42	66	10.91	11.10	9.96	9.59	10.37	72
ITD1	P. A. Bolzano-Bozen	9.33	9.87	11.43	13.41	10.90	23	9.34	10.15	11.62	13.41	11.03	20	9.36	10.59	11.63	13.41	11.15	17
ITD2	P. A. Trento	9.32	9.79	10.97	11.30	10.31	68	9.38	10.20	10.85	11.43	10.44	60	9.37	10.59	11.27	11.95	10.75	35
ITD3	Veneto	11.88	10.66	9.65	9.92	10.49	45	12.29	10.99	9.75	10.19	10.76	32	12.46	11.17	9.64	10.08	10.78	33
ITD4	Friuli-Venezia Giulia	9.53	9.79	9.26	9.05	9.40	204	9.59	9.90	9.31	9.09	9.47	206	9.65	10.26	9.29	9.13	9.57	193
ITD5	Emilia-Romagna	10.81	10.30	9.50	9.35	9.97	116	10.85	10.27	9.48	9.34	9.97	127	11.18	10.56	9.48	9.45	10.14	103
ITE1	Toscana	9.57	9.89	10.64	9.65	9.93	120	9.61	10.11	10.57	9.69	9.99	118	9.59	10.10	10.61	9.67	9.99	127

		Baseline period						Scenario period 2011-40						Scenario period 2041-70					
ID	NUTS-2 name	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	Rank	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	Rank	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	Rank
ITE2	Umbria	9.69	10.42	9.88	9.97	9.99	112	9.76	10.62	9.86	10.17	10.10	106	9.68	10.27	9.88	9.97	9.95	130
ITE3	Marche	9.38	9.84	9.85	9.73	9.70	166	9.42	9.90	9.87	9.88	9.77	160	9.37	9.69	9.79	9.69	9.63	186
ITE4	Lazio	9.67	10.92	9.99	9.65	10.05	103	9.64	11.11	10.02	9.66	10.09	107	9.62	10.96	10.02	9.62	10.04	118
ITF1	Abruzzo	9.39	9.78	9.81	9.99	9.74	158	9.42	9.72	9.87	10.11	9.78	155	9.41	9.54	9.78	10.00	9.68	178
ITF2	Molise	9.25	9.44	9.18	10.28	9.53	191	9.26	9.30	9.18	10.28	9.50	201	9.28	9.44	9.19	10.87	9.67	180
ITF3	Campania	9.69	9.99	9.65	9.65	9.74	154	9.69	10.03	9.65	9.70	9.76	161	9.66	9.90	9.66	9.51	9.68	177
ITF4	Puglia	9.39	9.23	9.25	8.92	9.20	233	9.35	9.12	9.25	8.92	9.16	243	9.36	9.10	9.26	8.92	9.16	239
ITF5	Basilicata	9.49	9.87	9.13	9.40	9.47	197	9.46	9.49	9.13	9.30	9.34	219	9.45	9.38	9.13	9.32	9.32	222
ITF6	Calabria	9.17	9.51	9.40	9.08	9.29	223	9.15	9.54	9.42	9.06	9.29	227	9.14	9.44	9.40	9.06	9.26	232
ITG1	Sicilia	9.25	10.08	9.33	9.17	9.45	198	9.23	10.00	9.31	9.10	9.41	211	9.24	10.27	9.31	9.10	9.47	202
ITG2	Sardegna	9.21	9.40	9.26	9.08	9.24	230	9.22	9.52	9.34	9.08	9.29	228	9.22	9.51	9.26	9.07	9.27	230
LT00	Lithuania	9.77	11.41	9.19	9.26	9.87	134	9.69	11.03	9.18	9.17	9.74	167	9.65	10.61	9.18	9.15	9.63	187
LU00	Luxembourg (Grand-Duché)	9.34	9.02	11.21	9.49	9.73	160	9.33	8.89	11.22	9.48	9.69	174	9.34	8.81	11.22	9.49	9.67	179
LV00	Latvia	10.03	8.89	9.26	11.57	9.88	128	9.98	10.07	9.22	10.92	10.03	115	9.90	10.10	9.23	10.82	10.00	126
NL11	Groningen	13.33	9.10	9.58	12.34	10.94	20	13.49	9.94	9.71	13.09	11.43	9	13.61	9.34	9.71	13.09	11.27	14
NL12	Friesland (NL)	12.75	9.64	9.32	10.01	10.35	64	13.49	9.38	9.35	10.77	10.62	41	13.61	9.18	9.35	10.77	10.59	48
NL13	Drenthe	10.71	8.64	9.41	9.99	9.66	173	10.95	9.03	9.46	10.13	9.87	142	10.95	8.72	9.46	10.13	9.78	159
NL21	Overijssel	13.33	9.22	9.67	11.01	10.69	34	13.49	9.34	9.63	11.04	10.76	33	13.61	9.55	9.64	10.67	10.75	34
NL22	Gelderland	11.96	10.15	9.69	9.99	10.41	53	11.96	10.38	9.68	9.99	10.47	54	12.05	10.22	9.72	10.06	10.48	59
NL23	Flevoland	9.01	7.94	8.97	8.88	8.69	255	9.01	7.61	8.97	8.88	8.60	255	9.01	7.20	8.97	8.88	8.48	255
NL31	Utrecht	11.97	9.43	10.92	9.79	10.48	47	12.46	9.53	11.46	10.48	10.93	25	11.98	9.59	10.91	9.79	10.52	56
NL32	Noord-Holland	10.15	9.09	10.37	9.19	9.68	169	10.15	9.23	10.37	9.19	9.72	171	10.15	9.18	10.54	9.21	9.75	165
NL33	Zuid-Holland	11.19	9.37	10.42	9.14	10.00	111	11.20	9.85	10.42	9.14	10.12	104	11.28	10.40	10.65	9.18	10.35	74
NL34	Zeeland	9.44	9.79	9.69	9.62	9.64	180	9.44	10.12	9.69	9.63	9.72	172	9.44	10.01	9.69	9.63	9.69	175
NL41	Noord-Brabant	11.65	10.20	11.60	10.72	11.03	15	11.60	10.22	11.64	10.71	11.02	21	11.49	10.22	11.46	10.37	10.87	29
NL42	Limburg (NL)	11.70	13.08	10.28	9.66	11.10	12	11.40	13.61	10.15	9.49	11.06	18	11.72	14.38	10.27	9.66	11.37	11
PL11	Lódzkie	10.09	10.26	9.35	9.31	9.74	155	10.02	10.03	9.35	9.31	9.67	180	9.98	10.14	9.36	9.33	9.69	173
PL12	Mazowieckie	11.02	11.57	9.45	9.75	10.41	55	11.04	11.76	9.55	9.93	10.53	49	10.88	11.68	9.53	9.84	10.45	63
PL21	Malopolskie	9.83	9.61	9.80	9.36	9.65	178	9.92	9.80	9.80	9.43	9.74	168	10.02	9.98	9.81	9.52	9.83	150
PL22	Slaskie	9.55	9.34	10.80	9.46	9.77	148	9.56	9.59	10.67	9.43	9.80	149	9.59	9.71	10.86	9.52	9.91	138
PL31	Lubelskie	10.53	11.27	9.22	9.77	10.17	84	10.58	11.41	9.22	9.78	10.21	92	10.26	11.49	9.21	9.70	10.13	104
PL32	Podkarpackie	10.17	9.59	9.44	9.76	9.74	159	10.25	9.83	9.45	9.92	9.86	143	10.41	9.98	9.47	9.95	9.95	129
PL33	Swietokrzyskie	10.04	10.05	9.40	9.52	9.75	151	10.12	9.91	9.37	9.51	9.73	170	10.23	10.86	9.40	9.65	10.02	120
PL34	Podlaskie	10.50	10.21	9.11	9.19	9.73	162	10.44	10.20	9.11	9.19	9.72	173	10.20	9.58	9.10	9.11	9.49	198
PL41	Wielkopolskie	10.88	11.70	9.46	9.76	10.41	54	10.71	11.13	9.42	9.59	10.19	95	10.67	11.13	9.43	9.60	10.18	99
PL42	Zachodniopomorskie	9.82	11.01	9.61	9.82	10.05	101	9.80	10.96	9.57	9.69	9.99	119	9.81	11.62	9.68	9.97	10.24	93
PL43	Lubuskie	11.77	12.35	9.39	10.27	10.88	25	11.67	11.97	9.39	10.02	10.71	35	11.72	11.79	9.39	9.92	10.65	43
PL51	Dolnoslaskie	10.37	10.29	9.95	10.67	10.32	67	10.56	10.82	10.03	11.19	10.64	39	10.69	10.99	9.97	11.32	10.73	38
PL52	Opolskie	10.65	10.45	9.42	10.31	10.20	81	10.73	10.62	9.47	10.36	10.29	80	10.73	10.70	9.48	10.36	10.30	80
PL61	Kujawsko-Pomorskie	10.13	10.69	9.40	9.48	9.91	126	10.06	10.75	9.40	9.41	9.89	138	10.05	10.76	9.41	9.43	9.90	140
PL62	Warminsko-Mazurskie	9.70	9.84	9.44	9.72	9.68	172	9.69	9.74	9.44	9.72	9.65	183	9.70	9.72	9.43	9.69	9.63	185
PL63	Pomorskie	9.81	9.75	9.56	9.48	9.65	176	9.82	9.84	9.57	9.48	9.67	179	9.82	10.01	9.59	9.49	9.72	169
PT11	Norte	9.23	9.85	9.36	8.98	9.35	215	9.24	10.40	9.40	8.99	9.49	202	9.24	10.38	9.40	8.99	9.49	199
PT15	Algarve	9.28	11.26	9.18	9.07	9.66	174	9.29	11.71	9.18	9.07	9.75	164	9.30	11.96	9.18	9.07	9.81	154
PT16	Centro (PT)	9.28	10.05	9.24	8.98	9.38	207	9.28	10.46	9.24	8.98	9.47	204	9.28	10.28	9.23	8.97	9.43	210
PT17	Lisboa	9.95	12.37	9.26	8.91	10.04	104	9.96	12.96	9.26	8.91	10.16	98	9.96	13.15	9.26	8.91	10.20	98
PT18	Alentejo	9.55	11.05	9.11	8.89	9.62	184	9.58	11.24	9.12	8.90	9.67	181	9.58	11.41	9.12	8.90	9.71	172
RO11	Nord-Vest	10.10	9.08	9.49	10.32	9.73	161	10.09	9.16	9.50	10.28	9.75	165	10.22	9.37	9.52	10.51	9.89	142
RO12	Centru	9.65	9.44	9.62	10.02	9.68	171	9.71	9.80	9.64	10.17	9.83	146	9.71	9.95	9.67	10.19	9.88	146
RO21	Nord-Est	10.07	9.98	9.51	9.92	9.87	133	10.11	10.16	9.51	9.92	9.92	133	10.13	10.47	9.53	9.90	10.00	125
RO22	Sud-Est	12.47	12.69	9.10	10.12	10.99	17	12.61	12.57	9.11	10.17	11.01	22	12.61	12.63	9.11	10.20	11.03	21
RO31	Sud - Muntenia	11.86	11.13	9.20	9.87	10.46	48	12.09	11.21	9.23	10.11	10.61	42	11.71	10.87	9.19	9.82	10.35	73
RO32	Bucuresti - Ilfov	10.79	8.95	11.55	9.40	10.12	92	11.03	10.36	11.29	9.41	10.50	52	10.46	9.39	11.96	9.35	10.24	94
RO41	Sud-Vest Oltenia	10.49	10.47	9.14	9.78	9.95	119	10.48	10.63	9.15	9.69	9.97	125	10.48	10.46	9.15	9.73	9.94	134
RO42	Vest	11.16	9.66	9.40	11.16	10.31	70	11.15	9.82	9.40	11.24	10.37	72	10.96	10.24	9.46	11.10	10.42	67
SE11	Stockholm	9.05	11.04	9.46	8.89	9.57	188	9.05	11.20	9.47	8.89	9.61	185	9.06	10.47	9.46	8.89	9.45	206
SE12	Östra Mellansverige	9.29	8.63	9.34	10.03	9.31	220	9.30	8.64	9.33	10.00	9.31	224	9.31	8.79	9.34	10.08	9.37	218
SE21	Småland med öarna	9.27	8.96	9.24	9.51	9.24	229	9.26	8.91	9.24	9.50	9.22	235	9.27	8.99	9.24	9.50	9.25	233
SE22	Sydsverige	9.27	9.45	9.40	9.36	9.37	210	9.28	9.44	9.39	9.32	9.36	215	9.29	9.48	9.43	9.38	9.39	215
SE23	Västsverige	9.28	8.93	9.32	9.91	9.35	214	9.29	9.06	9.32	10.21	9.46	207	9.31	9.37	9.32	10.40	9.59	192
SE31	Norra Mellansverige	9.27	8.57	9.16	9.72	9.17	236	9.28	8.87	9.16	9.78	9.27	232	9.29	8.88	9.16	9.81	9.28	228
SE32	Mellersta Norrland	9.36	8.49	9.00	9.17	9.00	248	9.36	8.66	9.00	9.17	9.05	247	9.36	8.67	9.00	9.17	9.05	248
SE33	Övre Norrland	9.31	8.55	9.01	9.29	9.03	246	9.32	8.61	9.01	9.29	9.05	246	9.32	8.63	9.01	9.29	9.06	247
SI01	Vzhodna Slovenija	9.91	10.22	9.70	10.62	10.10	94	10.03	10.86	9.76	11.24	10.45	56	10.04	10.54	9.70	10.85	10.27	88
SI02	Zahodna Slovenija	9.53	9.71	10.53	10.32	10.02	109	9.63	9.88	10.63	10.63	10.18	97	9.55	9.82	10.72	10.47	10.13	105
SK01	Bratislavský kraj	12.74	11.90	9.49	10.37	11.05	14	12.24	11.67	9.38	9.69	10.67	37	12.24	11.47	9.38	9.69	10.63	46
SK02	Západné Slovensko	12.45	10.48	9.49	10.54	10.69	35	11.75	10.37	9.51	10.22	10.43	63	11.62	10.33	9.53	10.20	10.39	69
SK03	Stredné Slovensko	9.57	9.75	10.46	12.05	10.41	52	9.55	9.55	10.52	12.15	10.39	68	9.51	9.43	10.63	12.18	10.38	71
SK04	Východné Slovensko	10.39	11.01	9.65	10.56	10.39	58	10.53	11.03	9.68	10.77	10.49	53	10.58	11.03	9.68	10.89	10.53	55
UKC1	Tees Valley and Durham	9.29	8.52	10.17	9.61	9.38	206	9.30	9.29	10.17	9.61	9.59	187	9.35	9.97	10.28	10.03	9.90	139
UKC2	Northumberland, […]	9.32	9.33	9.83	11.13	9.88	131	9.37	9.89	9.90	11.43	10.12	105	9.37	10.08	9.90	11.43	10.17	100
UKD1	Cumbria	9.30	9.64	9.97	10.85	9.93	123	9.31	9.78	9.97	10.95	9.98	121	9.33	10.27	9.90	10.95	10.10	109
UKD2	Cheshire	9.48	10.03	12.72	9.55	10.37	63	9.59	10.37	12.28	9.77	10.45	58	9.53	10.41	12.47	9.50	10.41	68
UKD3	Greater Manchester	9.85	10.50	13.25	10.79	11.03	16	9.98	10.35	13.35	11.15	11.14	16	9.98	10.22	13.45	11.15	11.12	18
UKD4	Lancashire	10.05	9.88	9.80	9.08	9.70	167	10.05	10.03	9.80	9.08	9.73	169	10.26	10.49	9.83	9.12	9.91	137
UKD5	Merseyside	9.04	9.12	9.14	8.88	9.05	244	9.04	9.12	9.14	8.88	9.05	248	9.04	9.12	9.14	8.88	9.05	249
UKE1	East Yorkshire […]	11.49	9.56	9.87	9.52	10.08	98	11.59	10.05	9.88	9.52	10.23	87	11.65	10.24	9.87	9.52	10.29	83
UKE2	North Yorkshire	9.98	9.34	9.36	9.44	9.53	192	9.98	9.56	9.36	9.46	9.59	188	10.20	10.20	9.46	10.19	10.01	122
UKE3	South Yorkshire	10.63	8.41	10.18	10.66	9.93	121	10.78	9.23	10.18	10.83	10.23	86	10.78	9.44	10.18	10.83	10.29	82
UKE4	West Yorkshire	9.61	9.67	11.86	11.82	10.68	36	9.69	9.54	11.84	11.97	10.70	36	9.72	10.31	11.89	12.30	11.00	23

		Baseline period						Scenario period 2011-40						Scenario period 2041-70					
ID	**NUTS-2 name**	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	**Rank**	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	**Rank**	FE_AREA	FE_DPTH	FS_POPD	FS_COM	F_Impact	**Rank**
UKF1	Derbyshire […]	10.34	9.46	9.95	11.25	10.23	80	10.58	9.75	9.86	11.27	10.35	75	10.54	9.56	9.87	11.27	10.29	84
UKF2	Leicestershire, […]	9.56	10.16	10.46	9.99	10.04	105	9.59	10.32	10.49	10.13	10.13	102	9.65	10.57	10.73	10.37	10.32	77
UKF3	Lincolnshire	13.33	10.07	9.38	13.08	11.33	10	13.49	10.01	9.38	13.04	11.34	11	13.61	9.98	9.39	13.28	11.41	10
UKG1	Herefordshire, […]	9.84	9.15	9.99	9.93	9.72	163	9.88	9.32	9.97	9.98	9.78	154	9.88	9.69	10.09	10.07	9.93	135
UKG2	Shropshire […]	9.56	9.48	10.61	10.60	10.05	102	9.63	9.84	10.53	10.60	10.14	100	9.62	9.86	10.62	10.73	10.20	97
UKG3	West Midlands	9.16	9.54	13.25	9.66	10.28	75	9.16	9.47	13.35	9.67	10.29	79	9.16	10.53	13.45	9.67	10.58	50
UKH1	East Anglia	11.05	9.68	9.42	9.99	10.02	107	11.33	9.77	9.44	10.29	10.18	96	11.58	9.96	9.43	10.30	10.29	85
UKH2	Bedfordshire, Hertfordshire	9.43	9.28	11.57	9.47	9.90	127	9.47	9.50	11.46	9.47	9.94	130	9.57	9.62	11.71	9.52	10.07	114
UKH3	Essex	9.23	8.96	9.95	9.19	9.33	218	9.24	9.47	10.00	9.19	9.47	205	9.26	9.38	9.98	9.19	9.45	205
UKI1	Inner London	10.98	10.34	13.25	13.41	11.92	3	11.51	10.89	13.35	13.41	12.24	2	11.59	11.14	13.45	13.41	12.35	3
UKI2	Outer London	10.04	9.97	13.25	10.60	10.89	24	10.15	10.54	13.35	10.70	11.12	17	10.22	10.51	13.45	10.93	11.21	16
UKJ1	Berkshire, […]	10.38	9.78	10.95	9.60	10.16	86	10.41	9.81	10.97	9.63	10.19	94	10.56	10.07	10.85	9.67	10.28	87
UKJ2	Surrey, East and West Sussex	9.89	9.87	12.11	12.26	10.97	18	10.02	10.72	11.94	12.24	11.19	14	10.04	10.69	12.01	12.28	11.22	15
UKJ3	Hampshire and Isle of Wight	9.23	8.47	10.11	8.91	9.16	238	9.23	8.90	10.10	8.91	9.27	231	9.23	8.61	10.11	8.91	9.20	237
UKJ4	Kent	9.31	8.79	10.17	9.28	9.37	208	9.34	9.71	10.16	9.52	9.68	177	9.37	9.40	10.19	9.52	9.61	188
UKK1	Gloucestershire, […]	9.52	10.21	10.13	8.91	9.68	170	9.64	10.60	9.98	8.88	9.76	163	9.69	10.88	9.94	8.88	9.82	153
UKK2	Dorset and Somerset	10.14	9.78	9.61	9.66	9.79	145	10.25	9.73	9.66	10.19	9.95	128	10.27	10.14	9.63	10.19	10.05	115
UKK3	Cornwall and Isles of Scilly	9.03	7.87	9.80	8.88	8.87	252	9.03	8.09	9.80	8.88	8.93	252	9.03	8.62	9.80	8.88	9.07	244
UKK4	Devon	9.11	8.23	11.01	9.48	9.41	203	9.13	8.40	10.64	9.48	9.38	213	9.14	8.73	10.59	9.48	9.46	203
UKL1	West Wales and The Valleys	9.15	8.76	9.57	9.11	9.14	240	9.16	8.94	9.54	9.14	9.19	239	9.16	9.00	9.54	9.14	9.21	236
UKL2	East Wales	9.50	9.46	10.06	9.46	9.62	183	9.58	9.81	10.32	9.79	9.87	141	9.59	9.69	10.28	9.57	9.78	161
UKM2	Eastern Scotland	9.24	8.92	9.41	9.18	9.19	235	9.25	9.10	9.44	9.19	9.24	233	9.25	9.24	9.44	9.19	9.28	227
UKM3	South Western Scotland	9.16	8.50	10.11	9.06	9.19	234	9.17	8.95	10.11	9.06	9.31	223	9.17	8.93	10.13	9.06	9.31	225
UKM5	North Eastern Scotland	9.25	8.76	9.84	9.68	9.37	209	9.23	8.57	9.80	9.64	9.30	226	9.26	8.94	9.83	9.66	9.41	213
UKM6	Highlands and Islands	9.09	8.77	9.18	8.93	8.99	249	9.09	8.92	9.18	8.93	9.03	249	9.09	9.04	9.19	8.93	9.06	245
UKN0	Northern Ireland	9.33	9.30	9.98	9.11	9.43	200	9.38	9.83	9.91	9.07	9.54	194	9.40	9.94	9.97	9.09	9.59	191

Table B.3: Drought proneness – normalised (shifted by 10) individual input parameters as well as final impact indicator for baseline period, scenario period 2011-40 and scenario period 2041-70, for each NUTS-2 region. Furthermore, the NUTS-2 ranking is given (1 = highest impact, 261 = lowest impact; light grey = regions within 4th quartile of baseline; dark grey = regions additionally within the 1st quartile of adaptive capacity, i.e. vulnerability hotspot regions).

	Baseline period								**Scenario period 2011-40**								**Scenario period 2041-70**							
ID	DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	**Rank**	DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	**Rank**	DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	**Rank**
AT11	9.75	10.75	9.85	10.75	10.27	9.64	10.21	91	9.78	10.70	9.71	10.44	10.27	9.64	10.13	94	9.86	10.79	9.82	9.72	10.27	9.64	10.16	99
AT12	9.62	10.57	9.71	10.36	10.36	10.01	10.14	98	9.64	10.52	9.60	9.95	10.36	10.01	10.06	106	9.72	10.58	9.66	8.59	10.36	10.01	10.05	112
AT13	9.71	10.81	10.16	8.82	9.14	10.03	9.80	163	9.76	10.74	10.04	8.66	9.14	10.03	9.75	162	9.85	10.82	10.09	8.29	9.14	10.03	9.76	167
AT21	9.58	7.94	6.72	8.56	10.01	10.15	8.77	255	9.60	7.94	6.45	8.26	10.01	10.15	8.67	254	9.61	8.26	6.75	8.38	10.01	10.15	8.79	254
AT22	9.47	8.71	7.41	8.60	10.41	10.11	9.10	244	9.48	8.68	7.17	8.37	10.41	10.11	9.01	247	9.51	8.89	7.39	8.55	10.41	10.11	9.09	246
AT31	9.36	9.48	8.32	9.53	10.41	9.71	9.49	218	9.36	9.41	8.09	8.68	10.41	9.71	9.29	228	9.39	9.52	8.23	8.19	10.41	9.71	9.31	229
AT32	9.23	6.57	6.72	8.16	9.85	10.18	8.36	261	9.25	6.60	6.32	8.14	9.85	10.18	8.29	261	9.26	6.85	6.46	8.19	9.85	10.18	8.37	261
AT33	9.38	6.63	6.72	8.16	9.97	10.34	8.44	259	9.39	6.70	6.32	8.15	9.97	10.34	8.36	259	9.41	7.00	6.46	8.21	9.97	10.34	8.46	259
AT34	9.40	7.13	6.72	8.24	9.59	9.68	8.41	260	9.41	7.23	6.32	8.17	9.59	9.68	8.33	260	9.48	7.52	6.46	8.25	9.59	9.68	8.43	260
BE10	9.45	9.84	9.63	8.21	9.10	7.19	8.89	252	9.52	9.72	9.56	8.21	9.10	7.19	8.87	252	9.67	9.82	9.72	8.45	9.10	7.19	8.93	253
BE21	9.44	9.84	9.73	9.25	9.37	12.37	9.99	122	9.51	9.71	9.65	8.77	9.37	12.37	9.88	133	9.67	9.79	9.76	9.25	9.37	12.37	9.87	142
BE22	9.44	9.90	9.62	9.78	9.39	11.33	9.93	131	9.47	9.77	9.53	9.35	9.39	11.33	9.83	144	9.62	9.88	9.69	9.67	9.39	11.33	9.88	139
BE23	9.45	9.79	9.79	10.28	9.32	10.61	9.91	136	9.52	9.66	9.71	9.78	9.32	10.61	9.80	148	9.68	9.75	9.86	9.86	9.32	10.61	9.85	149
BE24	9.43	9.85	9.67	10.18	9.23	8.86	9.57	206	9.48	9.73	9.59	9.98	9.23	8.86	9.52	210	9.66	9.83	9.73	10.78	9.23	8.86	9.57	206
BE25	9.51	9.88	10.19	11.00	9.50	10.55	10.14	100	9.59	9.77	10.14	10.87	9.50	10.55	10.10	100	9.73	9.86	10.25	10.81	9.50	10.55	10.16	98
BE31	9.41	9.76	9.59	11.17	9.34	6.74	9.27	234	9.45	9.66	9.54	10.97	9.34	6.74	9.23	230	9.65	9.77	9.70	10.30	9.34	6.74	9.29	231
BE32	9.44	9.76	9.68	10.61	9.35	8.12	9.51	216	9.50	9.67	9.62	10.40	9.35	8.12	9.46	215	9.71	9.79	9.78	8.97	9.35	8.12	9.53	211
BE33	9.36	9.06	8.91	9.33	9.25	8.79	9.15	243	9.35	8.98	8.77	9.01	9.25	8.79	9.06	243	9.53	9.16	9.06	8.47	9.25	8.79	9.16	242
BE34	9.34	9.18	9.23	8.86	9.83	10.23	9.48	219	9.36	9.11	9.12	8.48	9.83	10.23	9.38	220	9.55	9.31	9.39	9.27	9.83	10.23	9.48	215
BE35	9.39	9.50	9.37	9.90	9.42	9.27	9.51	215	9.42	9.42	9.30	9.42	9.42	9.27	9.42	218	9.61	9.56	9.50	10.87	9.42	9.27	9.48	217
BG31	10.50	11.25	10.47	10.95	10.51	7.99	10.26	83	10.86	11.38	10.72	10.91	10.51	7.99	10.38	73	11.15	11.46	10.91	11.00	10.51	7.99	10.47	63
BG32	10.73	11.33	10.71	11.01	10.70	7.99	10.39	68	10.97	11.46	10.94	11.04	10.70	7.99	10.49	57	11.29	11.54	11.08	11.38	10.70	7.99	10.58	53
BG33	10.92	11.35	11.03	11.25	10.53	8.59	10.62	46	11.25	11.47	11.23	11.43	10.53	8.59	10.75	39	11.48	11.55	11.37	10.55	10.53	8.59	10.82	37
BG34	11.02	11.32	11.10	10.46	10.42	8.36	10.45	63	11.39	11.45	11.30	10.57	10.42	8.36	10.57	50	11.76	11.56	11.49	9.15	10.42	8.36	10.68	43
BG41	10.36	11.05	10.49	9.15	9.65	8.83	9.94	129	10.63	11.21	10.67	9.13	9.65	8.83	10.03	112	11.01	11.35	10.96	9.70	9.65	8.83	10.16	100
BG42	10.87	11.22	10.87	9.67	10.95	8.46	10.34	77	11.18	11.37	11.04	9.70	10.95	8.46	10.44	63	11.69	11.50	11.29	10.10	10.95	8.46	10.58	51
CY00	13.00	11.66	12.05	10.23	9.77	10.03	11.12	14	13.83	11.76	12.12	10.38	9.77	10.03	11.28	7	14.55	11.87	12.27	9.72	9.77	10.03	11.37	7
CZ01	9.71	10.98	10.50	9.89	9.15	10.03	10.07	111	9.66	10.86	10.26	10.01	9.15	10.03	10.03	113	9.65	10.88	10.28	11.18	9.15	10.03	9.98	120
CZ02	9.62	10.83	10.33	11.20	9.59	10.80	10.42	65	9.56	10.73	10.10	11.36	9.59	10.80	10.38	72	9.59	10.76	10.14	10.22	9.59	10.80	10.38	73
CZ03	9.46	10.36	9.77	10.30	9.91	10.53	10.09	105	9.44	10.27	9.57	10.38	9.91	10.53	10.05	107	9.49	10.33	9.65	9.56	9.91	10.53	10.06	111
CZ04	9.49	10.55	10.19	9.77	9.48	10.44	10.02	116	9.49	10.42	9.92	9.69	9.48	10.44	9.94	120	9.51	10.47	10.01	10.26	9.48	10.44	9.95	126
CZ05	9.52	10.40	9.94	10.50	9.72	10.72	10.17	96	9.48	10.28	9.63	10.53	9.72	10.72	10.10	102	9.52	10.33	9.66	11.21	9.72	10.72	10.08	109
CZ06	9.69	10.74	10.16	11.22	9.90	10.54	10.41	67	9.70	10.68	10.00	11.36	9.90	10.54	10.40	70	9.75	10.73	10.05	10.10	9.90	10.54	10.41	68
CZ07	9.56	10.34	9.68	10.33	9.79	10.15	10.02	118	9.59	10.30	9.50	10.27	9.79	10.15	9.97	117	9.67	10.38	9.55	9.60	9.79	10.15	9.99	119
CZ08	9.45	10.14	9.27	9.99	9.42	10.43	9.82	160	9.46	10.11	9.15	9.91	9.42	10.43	9.78	155	9.51	10.17	9.18	10.08	9.42	10.43	9.75	170
DE11	9.46	9.85	9.16	10.50	9.28	8.27	9.44	222	9.46	9.76	8.97	10.23	9.28	8.27	9.35	223	9.59	9.88	9.20	9.48	9.28	8.27	9.41	225
DE12	9.42	9.42	8.71	9.85	9.19	8.63	9.24	237	9.42	9.37	8.57	9.59	9.19	8.63	9.16	235	9.57	9.51	8.79	8.94	9.19	8.63	9.23	235
DE13	9.36	8.69	8.03	9.43	9.35	9.37	9.06	247	9.36	8.71	7.94	9.01	9.35	9.37	8.98	250	9.50	8.89	8.19	9.11	9.35	9.37	9.07	249
DE14	9.36	9.20	8.21	9.95	9.49	9.37	9.29	233	9.35	9.18	8.02	9.36	9.49	9.37	9.15	236	9.45	9.33	8.30	8.84	9.49	9.37	9.20	236
DE21	9.32	9.07	7.64	9.70	9.42	9.89	9.18	241	9.32	8.99	7.37	9.03	9.42	9.89	9.01	248	9.37	9.12	7.60	9.55	9.42	9.89	9.05	250
DE22	9.38	9.71	8.98	10.59	10.01	10.55	9.90	141	9.38	9.60	8.74	9.81	10.01	10.55	9.71	172	9.44	9.71	8.89	9.32	10.01	10.55	9.72	175
DE23	9.49	10.07	9.56	9.93	9.67	10.02	9.83	156	9.47	9.93	9.31	9.48	9.67	10.02	9.69	181	9.56	10.01	9.44	9.47	9.67	10.02	9.71	178
DE24	9.56	10.23	9.89	10.11	9.48	9.83	9.89	144	9.55	10.07	9.61	9.66	9.48	9.83	9.74	164	9.63	10.15	9.76	10.13	9.48	9.83	9.76	169
DE25	9.48	10.23	9.68	10.41	9.44	10.10	9.93	132	9.46	10.12	9.47	10.26	9.44	10.10	9.85	140	9.60	10.20	9.67	10.13	9.44	10.10	9.90	132
DE26	9.49	10.23	9.86	10.57	9.37	8.89	9.76	171	9.50	10.08	9.65	10.29	9.37	8.89	9.66	185	9.61	10.18	9.84	9.20	9.37	8.89	9.71	179
DE27	9.36	9.09	7.83	9.67	9.62	10.36	9.33	229	9.34	9.04	7.63	9.34	9.62	10.36	9.22	231	9.43	9.19	7.90	8.41	9.62	10.36	9.29	230
DE30	9.53	10.78	10.56	8.41	9.10	10.52	9.82	159	9.51	10.64	10.34	8.40	9.10	10.52	9.76	159	9.63	10.65	10.36	10.52	9.10	10.52	9.78	163
DE41	9.51	10.78	10.68	10.68	9.66	10.52	10.34	76	9.51	10.65	10.47	10.63	9.66	10.52	10.28	80	9.59	10.65	10.47	10.08	9.66	10.52	10.28	85
DE42	9.53	10.81	10.58	10.16	9.45	10.52	10.21	90	9.50	10.68	10.35	10.14	9.45	10.52	10.14	92	9.60	10.71	10.40	8.38	9.45	10.52	10.17	97
DE50	9.36	9.79	9.89	8.41	9.19	10.66	9.57	208	9.38	9.63	9.77	8.39	9.19	10.66	9.52	209	9.47	9.65	9.80	8.92	9.19	10.66	9.53	210
DE60	9.40	9.80	9.83	9.15	9.15	10.98	9.74	176	9.41	9.62	9.62	8.94	9.15	10.98	9.64	189	9.50	9.65	9.69	9.49	9.15	10.98	9.67	186
DE71	9.47	10.14	9.77	9.84	9.21	9.24	9.65	198	9.45	10.00	9.60	9.62	9.21	9.24	9.56	202	9.58	10.12	9.80	9.38	9.21	9.24	9.61	201
DE72	9.39	9.72	9.48	9.72	9.39	8.87	9.47	220	9.36	9.54	9.25	9.47	9.39	8.87	9.36	221	9.50	9.68	9.47	9.31	9.39	8.87	9.42	220
DE73	9.37	9.77	9.47	10.11	9.40	9.32	9.61	203	9.36	9.60	9.30	9.52	9.40	9.32	9.46	216	9.43	9.71	9.47	10.87	9.40	9.32	9.48	216
DE80	9.46	10.46	10.57	11.12	9.67	11.44	10.48	57	9.49	10.32	10.39	11.00	9.67	11.44	10.41	68	9.54	10.30	10.35	10.29	9.67	11.44	10.40	69
DE91	9.34	9.88	9.68	10.82	9.33	8.91	9.69	193	9.35	9.72	9.45	10.50	9.33	8.91	9.57	200	9.41	9.78	9.52	10.68	9.33	8.91	9.58	204
DE92	9.34	9.97	9.76	11.32	9.36	9.51	9.90	138	9.35	9.79	9.59	10.97	9.36	9.51	9.79	152	9.47	9.86	9.68	9.77	9.36	9.51	9.80	159
DE93	9.36	9.91	9.87	10.23	9.76	10.52	9.98	124	9.38	9.74	9.70	9.98	9.76	10.52	9.89	132	9.47	9.77	9.75	10.21	9.76	10.52	9.88	137
DE94	9.37	9.69	9.80	10.82	9.65	10.52	10.01	120	9.38	9.54	9.70	10.44	9.65	10.52	9.91	128	9.50	9.58	9.75	9.37	9.65	10.52	9.91	130
DEA1	9.43	9.89	9.63	10.35	9.20	9.14	9.64	199	9.43	9.75	9.46	9.60	9.20	9.14	9.47	214	9.60	9.85	9.63	9.59	9.20	9.14	9.50	214
DEA2	9.35	9.49	9.10	9.94	9.18	8.05	9.21	240	9.33	9.36	8.91	9.75	9.18	8.05	9.12	237	9.51	9.48	9.17	9.72	9.18	8.05	9.19	237
DEA3	9.39	9.83	9.76	11.72	9.34	11.88	10.32	78	9.39	9.69	9.60	10.22	9.34	11.88	10.03	111	9.53	9.76	9.72	10.40	9.34	11.88	10.00	116
DEA4	9.31	9.59	9.48	11.27	9.29	9.30	9.73	180	9.30	9.41	9.28	10.72	9.29	9.30	9.58	197	9.43	9.51	9.42	9.08	9.29	9.30	9.60	202
DEA5	9.31	9.15	9.08	9.61	9.19	8.83	9.23	238	9.29	9.00	8.90	9.16	9.19	8.83	9.10	240	9.42	9.12	9.10	9.10	9.19	8.83	9.16	241
DEB1	9.34	9.77	9.41	9.78	9.38	7.66	9.23	239	9.34	9.65	9.24	9.25	9.38	7.66	9.10	239	9.51	9.80	9.51	8.86	9.38	7.66	9.17	239
DEB2	9.32	9.62	9.53	9.41	9.65	8.16	9.31	232	9.33	9.54	9.40	8.97	9.65	8.16	9.20	234	9.52	9.72	9.66	10.01	9.65	8.16	9.28	232
DEB3	9.44	10.13	9.75	10.54	9.45	8.67	9.69	192	9.41	10.04	9.64	10.23	9.45	8.67	9.60	192	9.58	10.15	9.84	8.88	9.45	8.67	9.65	191
DEC0	9.48	9.90	9.70	9.58	9.17	7.97	9.32	231	9.46	9.85	9.61	9.05	9.17	7.97	9.21	233	9.68	10.03	9.88	10.29	9.17	7.97	9.28	233
DED1	9.49	10.25	9.87	10.61	9.35	8.63	9.72	183	9.48	10.12	9.57	10.02	9.35	8.63	9.56	201	9.51	10.19	9.71	9.79	9.35	8.63	9.56	207

	Baseline period								Scenario period 2011-40								Scenario period 2041-70							
ID	DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	Rank	DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	Rank	DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	Rank
DED2	9.51	10.56	10.24	10.71	9.37	10.37	10.16	97	9.48	10.42	9.96	10.41	9.37	10.37	10.04	110	9.51	10.44	10.05	10.26	9.37	10.37	10.04	113
DED3	9.64	10.82	10.50	11.77	9.43	9.12	10.22	88	9.60	10.69	10.24	11.70	9.43	9.12	10.14	93	9.66	10.74	10.35	11.56	9.43	9.12	10.17	96
DEE0	9.51	10.74	10.47	11.36	9.51	9.78	10.25	84	9.50	10.59	10.27	11.32	9.51	9.78	10.19	87	9.58	10.62	10.33	11.21	9.51	9.78	10.21	92
DEF0	9.33	9.47	9.92	10.65	9.47	11.50	10.08	110	9.38	9.31	9.75	10.40	9.47	11.50	9.99	116	9.39	9.31	9.77	10.23	9.47	11.50	9.97	124
DEG0	9.49	10.34	9.96	10.88	9.47	8.99	9.88	146	9.48	10.20	9.74	10.51	9.47	8.99	9.76	158	9.54	10.27	9.90	10.34	9.47	8.99	9.79	161
DK01	9.49	10.01	10.55	10.57	9.18	11.35	10.21	89	9.51	9.82	10.39	10.24	9.18	11.35	10.11	96	9.44	9.80	10.31	9.99	9.18	11.35	10.04	114
DK02	9.48	10.13	10.74	11.84	9.54	10.83	10.44	64	9.52	9.98	10.60	11.92	9.54	10.83	10.41	66	9.48	9.97	10.55	11.84	9.54	10.83	10.40	70
DK03	9.35	9.37	10.23	11.84	9.75	12.03	10.42	66	9.39	9.23	10.09	11.92	9.75	12.03	10.39	71	9.37	9.25	10.10	11.94	9.75	12.03	10.39	71
DK04	9.38	9.57	10.46	11.81	9.68	12.32	10.53	54	9.42	9.42	10.33	11.67	9.68	12.32	10.46	60	9.38	9.43	10.30	11.42	9.68	12.32	10.43	66
DK05	9.45	9.61	10.50	11.64	9.78	11.64	10.45	61	9.51	9.46	10.35	11.27	9.78	11.64	10.35	76	9.43	9.48	10.32	11.02	9.78	11.64	10.30	81
EE00	9.59	9.83	10.41	9.20	9.79	10.43	9.91	133	9.59	9.63	10.15	9.40	9.79	10.43	9.87	137	9.46	9.45	9.90	9.60	9.79	10.43	9.81	156
ES11	10.36	8.37	8.97	8.98	10.49	10.20	9.57	207	10.82	8.83	9.67	8.43	10.49	10.20	9.75	163	11.13	9.20	10.04	8.38	10.49	10.20	9.90	131
ES12	10.07	9.79	10.06	8.33	9.77	9.22	9.56	209	10.36	10.09	10.40	8.22	9.77	9.22	9.69	180	10.63	10.34	10.65	8.24	9.77	9.22	9.80	158
ES13	9.69	9.17	9.31	8.39	9.79	9.88	9.40	225	9.94	9.52	9.69	8.27	9.79	9.88	9.54	206	10.15	9.78	9.98	8.28	9.79	9.88	9.66	189
ES21	9.67	9.36	9.06	8.82	9.32	9.67	9.35	228	9.91	9.70	9.48	8.62	9.32	9.67	9.48	212	10.15	9.97	9.79	8.62	9.32	9.67	9.61	200
ES22	10.05	10.23	9.87	9.60	9.87	9.34	9.87	149	10.28	10.49	10.23	9.33	9.87	9.34	9.96	119	10.68	10.67	10.46	9.28	9.87	9.34	10.08	108
ES23	10.30	10.94	10.62	9.77	9.83	10.03	10.29	81	10.64	11.06	10.79	8.98	9.83	10.03	10.24	83	11.05	11.16	10.97	8.85	9.83	10.03	10.32	80
ES24	10.78	10.98	10.79	9.90	9.95	9.51	10.35	71	11.09	11.13	10.95	9.68	9.95	9.51	10.41	65	11.55	11.23	11.07	9.49	9.95	9.51	10.48	61
ES30	11.78	11.29	11.36	9.73	9.16	10.89	10.71	39	12.14	11.45	11.59	9.46	9.16	10.89	10.78	38	12.64	11.53	11.68	9.30	9.16	10.89	10.84	36
ES41	11.07	10.89	10.95	10.39	10.24	10.49	10.72	38	11.51	11.09	11.22	10.12	10.24	10.49	10.82	35	11.96	11.20	11.37	10.02	10.24	10.49	10.92	32
ES42	12.06	11.54	11.51	10.66	10.22	9.87	11.00	20	12.40	11.66	11.67	10.51	10.22	9.87	11.07	18	12.98	11.73	11.78	10.33	10.22	9.87	11.16	18
ES43	13.00	11.37	11.51	10.69	11.02	11.06	11.47	2	13.64	11.52	11.79	10.55	11.02	11.06	11.61	2	14.27	11.60	11.90	10.33	11.02	11.06	11.70	2
ES51	10.68	10.49	10.42	9.42	9.40	9.67	10.04	114	10.97	10.65	10.58	9.04	9.40	9.67	10.07	104	11.29	10.83	10.76	8.84	9.40	9.67	10.13	103
ES52	12.15	11.52	11.60	9.80	9.66	9.72	10.74	35	12.51	11.57	11.62	9.30	9.66	9.72	10.71	40	13.01	11.64	11.73	9.09	9.66	9.72	10.77	40
ES53	12.28	11.45	11.79	10.58	9.32	9.99	10.90	28	12.51	11.52	11.80	10.29	9.32	9.99	10.90	31	13.04	11.58	11.94	10.01	9.32	9.99	10.96	28
ES61	13.00	11.43	11.58	10.60	10.39	10.02	11.18	9	13.83	11.58	11.81	10.19	10.39	10.02	11.29	6	14.55	11.66	11.93	9.88	10.39	10.02	11.36	10
ES62	13.00	11.87	11.90	10.17	11.03	9.50	11.24	5	13.31	11.90	11.91	9.86	11.03	9.50	11.23	12	13.98	11.94	12.00	9.63	11.03	9.50	11.30	13
FI13	9.49	9.65	10.38	8.27	10.75	10.01	9.77	170	9.53	9.51	10.23	8.15	10.75	10.01	9.70	176	9.40	9.40	10.00	8.20	10.75	10.01	9.63	196
FI18	9.59	9.78	10.51	9.09	9.49	10.01	9.78	169	9.63	9.61	10.31	8.99	9.49	10.01	9.71	173	9.49	9.44	10.08	9.02	9.49	10.01	9.62	198
FI19	9.58	9.84	10.47	8.72	10.12	10.01	9.82	162	9.58	9.65	10.25	8.53	10.12	10.01	9.72	169	9.50	9.52	10.07	8.56	10.12	10.01	9.65	192
FI1A	9.81	9.79	10.79	8.24	10.46	10.01	9.86	151	9.79	9.65	10.63	8.19	10.46	10.01	9.80	149	9.69	9.63	10.51	8.24	10.46	10.01	9.76	168
FI20	9.64	9.45	11.07	8.65	9.82	10.01	9.79	166	9.63	9.37	10.90	8.15	9.82	10.01	9.65	186	9.55	9.35	10.80	8.19	9.82	10.01	9.62	199
FR10	9.66	10.56	10.41	10.95	9.12	8.41	9.85	152	9.75	10.59	10.48	10.61	9.12	8.41	9.84	142	10.02	10.72	10.71	10.49	9.12	8.41	9.92	127
FR21	9.52	10.05	9.86	10.99	10.66	9.31	10.09	104	9.58	10.03	9.84	10.52	10.66	9.31	10.02	114	9.82	10.20	10.10	10.45	10.66	9.31	10.13	104
FR22	9.56	10.21	10.21	11.66	9.51	8.67	9.97	125	9.63	10.20	10.23	11.17	9.51	8.67	9.92	125	9.85	10.34	10.42	11.04	9.51	8.67	10.00	117
FR23	9.55	10.01	10.28	11.04	9.55	7.30	9.59	205	9.65	10.05	10.33	10.84	9.55	7.30	9.59	196	9.89	10.21	10.53	10.75	9.55	7.30	9.68	185
FR24	9.66	10.52	10.29	11.16	9.44	9.29	10.09	106	9.81	10.59	10.42	11.02	9.44	9.29	10.12	95	10.09	10.75	10.64	10.96	9.44	9.29	10.23	89
FR25	9.64	9.96	10.39	9.98	10.30	7.94	9.71	187	9.79	10.01	10.45	9.89	10.30	7.94	9.73	167	10.02	10.19	10.66	9.85	10.30	7.94	9.83	151
FR26	9.51	10.08	9.73	9.97	9.87	9.02	9.74	178	9.59	10.11	9.76	9.67	9.87	9.02	9.71	174	9.84	10.32	10.05	9.64	9.87	9.02	9.83	152
FR30	9.49	9.96	10.17	11.43	9.39	7.93	9.71	185	9.56	9.88	10.14	11.15	9.39	7.93	9.67	184	9.74	10.00	10.30	11.03	9.39	7.93	9.73	172
FR41	9.45	9.50	9.25	9.94	9.30	9.91	9.60	204	9.44	9.49	9.20	9.57	9.30	9.91	9.53	207	9.66	9.68	9.47	9.55	9.30	9.91	9.63	194
FR42	9.38	9.36	8.81	10.20	9.28	10.98	9.69	191	9.39	9.32	8.79	9.70	9.28	10.98	9.59	195	9.56	9.44	8.97	9.63	9.28	10.98	9.67	187
FR43	9.43	8.90	8.47	9.30	9.71	8.38	9.06	248	9.49	8.98	8.54	8.97	9.71	8.38	9.04	244	9.69	9.26	8.86	8.94	9.71	8.38	9.16	240
FR51	9.80	10.36	10.51	10.70	9.93	9.00	10.08	107	9.99	10.44	10.66	10.43	9.93	9.00	10.11	98	10.32	10.61	10.85	10.37	9.93	9.00	10.21	91
FR52	9.69	9.41	10.19	10.88	10.22	8.42	9.82	161	9.91	9.50	10.38	10.08	10.22	8.42	9.77	156	10.13	9.73	10.54	10.01	10.22	8.42	9.87	144
FR53	9.73	10.27	10.16	11.20	10.18	9.95	10.28	82	9.99	10.38	10.37	10.99	10.18	9.95	10.35	75	10.21	10.55	10.56	10.90	10.18	9.95	10.44	65
FR61	9.67	9.96	9.43	9.77	9.79	10.82	9.94	128	9.84	10.18	9.77	9.42	9.79	10.82	10.01	115	10.11	10.40	10.02	9.39	9.79	10.82	10.13	105
FR62	9.78	10.06	9.51	10.11	10.08	10.21	10.00	121	10.00	10.30	9.85	9.81	10.08	10.21	10.08	103	10.31	10.51	10.06	9.78	10.08	10.21	10.20	93
FR63	9.59	9.78	9.32	9.02	9.88	10.30	9.68	195	9.72	9.94	9.55	8.73	9.88	10.30	9.72	170	10.01	10.21	9.87	8.73	9.88	10.30	9.86	147
FR71	9.70	9.08	8.98	9.12	9.37	10.07	9.42	223	9.79	9.22	9.05	8.64	9.37	10.07	9.39	219	10.05	9.53	9.32	8.65	9.37	10.07	9.52	212
FR72	9.56	10.07	9.53	9.04	10.11	10.84	9.89	145	9.66	10.17	9.64	8.71	10.11	10.84	9.88	134	9.93	10.42	9.93	8.73	10.11	10.84	10.01	115
FR81	10.27	10.17	10.21	9.57	9.74	10.36	10.10	103	10.47	10.33	10.38	9.44	9.74	10.36	10.16	91	10.90	10.53	10.54	9.43	9.74	10.36	10.28	84
FR82	10.64	9.56	9.99	8.98	9.50	9.68	9.76	173	10.77	9.75	10.16	8.72	9.50	9.68	9.79	153	11.21	10.02	10.30	8.74	9.50	9.68	9.92	129
FR83	11.41	9.82	10.68	8.49	9.38	11.10	10.14	99	11.57	10.03	10.78	8.44	9.38	11.10	10.21	86	12.18	10.25	11.00	8.47	9.38	11.10	10.36	74
GR11	11.57	11.33	11.41	9.45	13.08	10.11	11.15	10	12.02	11.47	11.56	9.36	13.08	10.11	11.25	11	12.64	11.60	11.76	9.33	13.08	10.11	11.39	5
GR12	11.58	11.56	11.42	9.94	11.27	10.09	11.00	19	12.01	11.68	11.56	9.59	11.27	10.09	11.05	20	12.48	11.77	11.72	9.45	11.27	10.09	11.13	19
GR13	11.14	11.11	10.98	9.58	12.49	10.38	10.96	25	11.47	11.32	11.20	9.29	12.49	10.38	11.03	21	11.88	11.42	11.40	9.21	12.49	10.38	11.13	20
GR14	12.12	11.35	11.47	9.35	12.74	10.18	11.20	8	12.49	11.48	11.63	9.15	12.74	10.18	11.26	9	12.98	11.57	11.78	9.09	12.74	10.18	11.36	11
GR21	11.46	10.44	10.80	8.67	12.58	10.39	10.71	40	11.88	10.71	11.00	8.42	12.58	10.39	10.80	36	12.42	10.89	11.31	8.39	12.58	10.39	10.94	30
GR22	13.00	10.30	11.40	9.68	12.19	10.03	11.09	16	13.83	10.60	11.60	8.71	12.19	10.03	11.09	17	14.55	10.77	11.77	8.59	12.19	10.03	11.21	16
GR23	12.63	10.75	11.33	9.34	12.93	10.03	11.15	11	13.18	10.99	11.54	8.79	12.93	10.03	11.19	13	13.78	11.16	11.75	8.66	12.93	10.03	11.30	12
GR24	12.91	11.28	11.62	9.22	12.48	10.03	11.24	6	13.38	11.41	11.79	8.87	12.48	10.03	11.28	8	13.93	11.52	11.92	8.81	12.48	10.03	11.38	6
GR25	13.00	10.91	11.56	9.38	13.08	10.03	11.29	4	13.60	11.13	11.77	8.89	13.08	10.03	11.35	4	14.35	11.29	11.95	8.83	13.08	10.03	11.49	4
GR30	13.00	11.61	12.03	9.05	9.24	10.03	10.78	34	13.83	11.72	12.18	8.33	9.24	10.03	10.78	37	14.55	11.82	12.28	8.33	9.24	10.03	10.89	35
GR41	13.00	11.05	11.84	9.43	11.33	10.14	11.12	12	13.83	11.25	11.95	8.77	11.33	10.14	11.16	14	14.55	11.36	12.06	8.74	11.33	10.14	11.28	15
GR42	13.00	11.05	11.98	8.89	10.30	10.30	10.89	29	13.83	11.24	12.11	8.36	10.30	10.30	10.94	29	14.55	11.36	12.27	8.34	10.30	10.30	11.07	22
GR43	13.00	11.05	11.75	9.89	12.21	10.03	11.32	3	13.83	11.25	11.91	9.35	12.21	10.03	11.39	3	14.55	11.45	12.11	9.23	12.21	10.03	11.53	3
HU10	10.07	11.16	10.65	10.69	9.25	7.56	9.86	150	10.15	11.16	10.64	11.08	9.25	7.56	9.93	121	10.32	11.22	10.73	11.04	9.25	7.56	9.98	121
HU21	9.91	10.98	10.43	11.05	9.84	7.41	9.90	139	10.00	10.97	10.38	11.21	9.84	7.41	9.93	122	10.13	11.04	10.47	11.15	9.84	7.41	9.97	123
HU22	9.81	10.88	10.10	11.02	10.03	7.42	9.84	154	9.88	10.84	9.98	11.23	10.03	7.42	9.86	139	9.98	10.92	10.09	11.11	10.03	7.42	9.89	134
HU23	9.94	10.97	10.25	11.21	10.49	8.24	10.18	93	10.04	10.97	10.20	11.41	10.49	8.24	10.22	85	10.20	11.07	10.35	11.34	10.49	8.24	10.29	83
HU31	9.99	11.06	10.37	10.64	9.69	8.63	10.08	108	10.11	11.06	10.31	10.46	9.69	8.63	10.06	105	10.19	11.11	10.40	10.44	9.69	8.63	10.10	107
HU32	9.99	11.04	10.40	11.72	10.29	10.07	10.62	45	10.08	11.05	10.34	11.92	10.29	10.07	10.66	42	10.24	11.10	10.43	11.70	10.29	10.07	10.69	42
HU33	10.11	11.24	10.62	11.79	10.81	9.03	10.61	48	10.18	11.25	10.61	11.92	10.81	9.03	10.64	44	10.41	11.31	10.73	11.91	10.81	9.03	10.71	41
IE01	9.12	7.56	8.75	8.48	10.47	10.76	9.16	242	9.15	7.45	8.69	8.32	10.47	10.76	9.11	238	9.25	7.58	8.85	8.37	10.47	10.76	9.18	238
IE02	9.22	7.57	8.79	8.89	9.78	9.82	9.02	251	9.26	7.56	8.88	8.58	9.78	9.82	8.98	249	9.40	7.74	9.02	8.61	9.78	9.82	9.07	248
ITC1	10.28	9.18	8.90	9.56	9.73	10.67	9.74	175	10.39	9.37	9.00	9.22	9.73	10.67	9.76	161	10.57	9.66	9.26	9.12	9.73	10.67	9.86	148
ITC2	9.57	6.57	6.76	8.22	9.77	11.03	8.53	258	9.62	6.41	6.74	8.14	9.77	11.03	8.49	258	9.73	6.52	7.03	8.19	9.77	11.03	8.59	257
ITC3	10.44	8.70	9.02	8.59	9.43	9.27	9.26	235	10.55	8.85	9.12	8.31	9.43	9.27	9.27	229	10.85	9.16	9.46	8.28	9.43	9.27	9.41	223

ID	Baseline period DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	Rank	Scenario period 2011-40 DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	Rank	Scenario period 2041-70 DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	Rank
ITC4	10.15	9.30	8.54	10.15	9.36	10.76	9.72	182	10.23	9.36	8.51	10.02	9.36	10.76	9.72	168	10.34	9.61	8.80	9.92	9.36	10.76	9.83	153
ITD1	9.89	8.20	8.38	8.39	10.25	11.48	9.40	224	9.94	8.24	8.04	8.14	10.25	11.48	9.30	225	9.96	8.53	8.19	8.19	10.25	11.48	9.39	226
ITD2	10.30	8.72	8.26	8.44	9.69	10.80	9.36	226	10.36	8.78	8.09	8.15	9.69	10.80	9.29	226	10.38	9.10	8.39	8.20	9.69	10.80	9.41	224
ITD3	10.15	9.70	8.93	10.72	9.55	11.32	10.08	109	10.25	9.72	8.82	10.53	9.55	11.32	10.05	108	10.36	9.94	9.11	10.42	9.55	11.32	10.15	101
ITD4	9.96	8.67	7.73	9.85	9.46	10.49	9.36	227	10.04	8.71	7.51	9.73	9.46	10.49	9.31	224	10.10	8.99	7.86	9.57	9.46	10.49	9.42	221
ITD5	10.28	10.09	9.59	10.97	9.77	10.41	10.22	87	10.42	10.11	9.62	10.47	9.77	10.41	10.18	89	10.60	10.30	9.84	10.32	9.77	10.41	10.25	88
ITE1	10.39	9.53	9.45	10.01	9.66	10.07	9.89	143	10.54	9.66	9.61	9.66	9.66	10.07	9.91	127	10.91	9.89	9.91	9.30	9.66	10.07	9.99	118
ITE2	10.35	10.47	10.39	10.19	9.82	10.37	10.31	79	10.48	10.57	10.49	9.67	9.82	10.37	10.27	81	10.87	10.75	10.74	9.33	9.82	10.37	10.34	77
ITE3	10.20	10.36	10.01	10.67	9.53	9.15	10.02	117	10.40	10.46	10.14	9.63	9.53	9.15	9.92	124	10.65	10.62	10.36	8.83	9.53	9.15	9.87	143
ITE4	11.17	10.85	11.23	10.54	9.39	10.80	10.70	42	11.35	10.94	11.38	9.82	9.39	10.80	10.64	46	11.81	11.07	11.52	9.30	9.39	10.80	10.65	45
ITF1	10.47	10.54	10.85	9.84	9.69	9.54	10.19	92	10.70	10.66	10.97	8.94	9.69	9.54	10.10	101	11.00	10.78	11.15	8.51	9.69	9.54	10.11	106
ITF2	10.77	10.97	11.18	10.46	10.28	9.87	10.63	44	11.05	11.07	11.33	9.72	10.28	9.87	10.58	49	11.37	11.16	11.48	8.93	10.28	9.87	10.52	58
ITF3	11.13	10.70	11.10	10.39	9.78	10.48	10.64	43	11.45	10.82	11.27	9.85	9.78	10.48	10.64	45	11.81	10.95	11.45	9.29	9.78	10.48	10.64	47
ITF4	11.66	11.33	11.67	11.84	10.60	10.03	11.22	7	11.99	11.42	11.74	11.92	10.60	10.03	11.31	5	12.37	11.50	11.89	11.56	10.60	10.03	11.36	8
ITF5	11.28	10.89	11.33	10.87	10.42	8.81	10.61	47	11.58	11.04	11.48	10.16	10.42	8.81	10.59	48	11.99	11.17	11.66	9.69	10.42	8.81	10.61	48
ITF6	12.15	10.69	11.46	10.46	10.76	10.12	10.97	24	12.56	10.90	11.66	9.84	10.76	10.12	10.99	24	13.10	11.05	11.82	9.49	10.76	10.12	11.05	24
ITG1	13.00	11.40	12.04	11.32	10.35	8.78	11.12	13	13.83	11.52	12.13	10.66	10.35	8.78	11.15	16	14.50	11.60	12.26	10.20	10.35	8.78	11.20	17
ITG2	12.74	11.04	11.61	10.05	10.09	10.27	10.98	23	12.94	11.16	11.66	9.61	10.09	10.27	10.95	27	13.62	11.27	11.86	9.40	10.09	10.27	11.05	23
LT00	9.57	10.10	10.18	10.46	10.71	10.83	10.35	73	9.55	9.95	9.94	11.04	10.71	10.83	10.37	74	9.49	9.83	9.73	11.22	10.71	10.83	10.34	79
LU00	9.39	9.69	9.71	9.44	9.31	10.20	9.66	196	9.42	9.60	9.62	8.88	9.31	10.20	9.54	205	9.63	9.77	9.87	8.82	9.31	10.20	9.63	195
LV00	9.56	9.97	10.30	9.23	10.62	11.25	10.18	94	9.55	9.77	10.02	9.66	10.62	11.25	10.17	90	9.44	9.63	9.79	10.14	10.62	11.25	10.18	94
NL11	9.40	9.51	9.79	11.23	9.56	10.74	10.06	112	9.45	9.35	9.68	10.81	9.56	10.74	9.96	118	9.55	9.39	9.72	10.72	9.56	10.74	9.98	122
NL12	9.40	9.37	9.86	8.57	9.88	11.29	9.74	177	9.49	9.18	9.74	8.52	9.88	11.29	9.69	179	9.57	9.25	9.81	8.55	9.88	11.29	9.73	174
NL13	9.39	9.62	9.75	10.33	9.74	10.72	9.96	126	9.45	9.47	9.64	9.68	9.74	10.72	9.82	146	9.53	9.52	9.72	9.49	9.74	10.72	9.82	154
NL21	9.42	9.74	9.72	8.89	9.60	10.72	9.71	186	9.48	9.59	9.62	8.72	9.60	10.72	9.65	187	9.57	9.65	9.71	8.73	9.60	10.72	9.68	183
NL22	9.45	9.79	9.71	9.04	9.63	10.72	9.75	174	9.48	9.66	9.63	8.90	9.63	10.72	9.70	177	9.61	9.71	9.70	8.86	9.63	10.72	9.73	173
NL23	9.43	9.65	9.77	10.26	9.73	10.28	9.89	142	9.50	9.50	9.67	10.09	9.73	10.28	9.84	143	9.60	9.56	9.76	10.04	9.73	10.28	9.87	141
NL31	9.46	9.66	9.75	8.36	9.23	11.36	9.64	200	9.52	9.54	9.70	8.25	9.23	11.36	9.60	193	9.64	9.59	9.77	8.26	9.23	11.36	9.64	193
NL32	9.48	9.49	9.99	9.50	9.35	11.06	9.84	155	9.56	9.37	9.91	9.20	9.35	11.06	9.77	157	9.67	9.45	9.96	9.09	9.35	11.06	9.79	162
NL33	9.47	9.57	9.81	9.66	9.52	10.42	9.78	167	9.53	9.44	9.74	9.34	9.52	10.42	9.70	175	9.68	9.50	9.80	9.26	9.52	10.42	9.73	171
NL34	9.49	9.57	9.86	11.84	9.58	10.32	10.12	101	9.55	9.43	9.76	11.92	9.58	10.32	10.11	99	9.72	9.51	9.87	11.94	9.58	10.32	10.17	95
NL41	9.48	9.90	9.80	10.02	9.55	10.72	9.95	127	9.53	9.78	9.75	9.67	9.55	10.72	9.87	136	9.69	9.85	9.84	9.50	9.55	10.72	9.89	133
NL42	9.47	9.96	9.68	10.23	9.57	10.23	9.90	140	9.49	9.83	9.54	9.87	9.57	10.23	9.80	150	9.63	9.93	9.73	9.72	9.57	10.23	9.85	150
PL11	9.71	10.92	10.51	11.24	11.36	11.62	10.92	27	9.72	10.83	10.30	11.70	11.36	11.62	10.95	28	9.72	10.77	10.21	11.50	11.36	11.62	10.90	34
PL12	9.73	10.94	10.61	10.95	11.14	11.29	10.82	33	9.72	10.87	10.43	11.28	11.14	11.29	10.83	33	9.73	10.80	10.30	11.09	11.14	11.29	10.77	39
PL21	9.52	10.13	9.03	10.51	11.75	9.24	10.03	115	9.55	10.10	8.90	9.89	11.75	9.24	9.91	126	9.57	10.07	8.83	9.69	11.75	9.24	9.86	146
PL22	9.53	10.21	9.38	10.20	9.50	11.08	10.01	119	9.54	10.16	9.19	9.92	9.50	11.08	9.93	123	9.55	10.14	9.14	9.71	9.50	11.08	9.88	140
PL31	9.69	10.94	10.61	11.03	13.08	9.66	10.83	32	9.70	10.92	10.56	11.04	13.08	9.66	10.82	34	9.76	10.85	10.42	10.87	13.08	9.66	10.77	38
PL32	9.60	10.50	9.70	10.29	13.08	9.83	10.49	56	9.62	10.50	9.64	10.10	13.08	9.83	10.45	62	9.66	10.46	9.53	9.88	13.08	9.83	10.39	72
PL33	9.61	10.71	10.07	10.91	13.00	10.03	10.72	37	9.63	10.68	9.94	10.93	13.00	10.03	10.70	41	9.68	10.62	9.82	10.74	13.00	10.03	10.65	46
PL34	9.59	10.75	10.56	10.33	13.08	12.04	11.05	18	9.58	10.71	10.45	10.22	13.08	12.04	11.01	22	9.60	10.63	10.31	10.08	13.08	12.04	10.95	29
PL41	9.66	10.93	10.62	11.24	12.02	11.80	11.07	17	9.68	10.81	10.40	11.46	12.02	11.80	11.05	19	9.66	10.78	10.35	11.29	12.02	11.80	11.01	26
PL42	9.54	10.52	10.58	10.46	10.26	11.91	10.57	49	9.55	10.38	10.36	10.37	10.26	11.91	10.50	56	9.58	10.32	10.27	10.04	10.26	11.91	10.42	67
PL43	9.58	10.85	10.59	9.95	10.38	11.78	10.55	52	9.57	10.72	10.34	10.23	10.38	11.78	10.53	53	9.60	10.71	10.37	10.09	10.38	11.78	10.52	57
PL51	9.54	10.66	10.12	11.03	10.38	10.10	10.34	75	9.54	10.53	9.84	11.09	10.38	10.10	10.28	79	9.55	10.54	9.85	10.87	10.38	10.10	10.26	87
PL52	9.58	10.69	10.02	11.17	11.24	10.30	10.53	53	9.57	10.60	9.83	11.50	11.24	10.30	10.53	52	9.59	10.60	9.81	11.30	11.24	10.30	10.51	60
PL61	9.68	10.86	10.58	11.42	11.87	11.33	10.99	21	9.65	10.74	10.36	11.64	11.87	11.33	10.96	26	9.62	10.69	10.26	11.46	11.87	11.33	10.91	33
PL62	9.58	10.51	10.42	10.88	11.35	11.44	10.73	36	9.55	10.40	10.20	10.81	11.35	11.44	10.65	43	9.53	10.32	10.08	10.58	11.35	11.44	10.58	52
PL63	9.56	10.25	10.38	10.54	10.39	11.40	10.45	60	9.53	10.10	10.15	10.66	10.39	11.40	10.40	69	9.50	10.00	10.02	10.50	10.39	11.40	10.34	78
PT11	11.25	9.52	9.90	9.82	11.19	10.25	10.35	72	11.90	9.86	10.48	9.05	11.19	10.25	10.46	59	12.39	10.07	10.72	8.89	11.19	10.25	10.58	54
PT15	13.00	11.22	11.84	9.66	10.02	10.22	10.99	22	13.83	11.39	12.07	9.62	10.02	10.22	11.16	15	14.55	11.51	12.19	9.60	10.02	10.22	11.29	14
PT16	12.02	10.24	10.51	9.44	12.88	11.52	11.09	15	12.66	10.53	10.98	9.10	12.88	11.52	11.26	10	13.16	10.69	11.19	8.96	12.88	11.52	11.36	9
PT17	13.00	10.94	11.37	9.33	9.27	11.89	10.94	26	13.83	11.12	11.67	8.68	9.27	11.89	11.00	23	14.51	11.25	11.81	8.50	9.27	11.89	11.08	21
PT18	13.00	11.27	11.56	10.92	10.96	11.50	11.57	1	13.83	11.43	11.84	10.84	10.96	11.50	11.75	1	14.55	11.53	11.97	10.76	10.96	11.50	11.88	1
RO11	10.03	10.72	9.95	9.73	13.08	9.92	10.56	50	10.10	10.77	9.96	9.61	13.08	9.92	10.56	51	10.20	10.80	9.97	9.61	13.08	9.92	10.59	50
RO12	10.24	10.92	10.28	9.27	11.83	10.14	10.47	59	10.30	10.98	10.33	9.25	11.83	10.14	10.49	58	10.41	11.02	10.35	9.26	11.83	10.14	10.52	56
RO21	10.45	11.13	10.36	10.10	13.08	8.47	10.56	51	10.58	11.21	10.51	10.17	13.08	8.47	10.63	47	10.69	11.24	10.50	10.15	13.08	8.47	10.65	44
RO22	10.93	11.36	10.86	11.19	13.08	8.04	10.85	30	11.22	11.46	11.06	11.25	13.08	8.04	10.96	25	11.41	11.51	11.14	11.19	13.08	8.04	11.01	27
RO31	10.55	11.10	10.35	11.44	13.08	8.64	10.83	31	10.76	11.22	10.52	11.55	13.08	8.64	10.93	30	11.04	11.31	10.66	11.49	13.08	8.64	11.02	25
RO32	10.73	11.27	10.41	11.35	9.34	9.04	10.36	70	10.85	11.35	10.56	11.32	9.34	9.04	10.42	64	11.25	11.44	10.70	11.26	9.34	9.04	10.52	59
RO41	10.37	10.86	10.04	10.53	13.08	9.38	10.70	41	10.69	10.99	10.20	10.74	13.08	9.38	10.84	32	10.94	11.12	10.41	10.70	13.08	9.38	10.94	31
RO42	10.07	10.75	9.90	9.97	12.46	9.66	10.48	58	10.17	10.83	9.96	10.00	12.46	9.66	10.52	55	10.37	10.93	10.14	9.99	12.46	9.66	10.61	49
SE11	9.72	10.24	10.92	9.06	9.13	10.03	9.87	147	9.69	10.11	10.76	8.71	9.13	10.03	9.76	160	9.55	10.02	10.58	8.54	9.13	10.03	9.66	190
SE12	9.64	10.22	10.68	9.28	9.55	10.03	9.94	130	9.64	10.07	10.52	9.23	9.55	10.03	9.88	135	9.49	10.00	10.38	9.20	9.55	10.03	9.81	157
SE21	9.54	10.05	10.60	8.70	9.86	10.03	9.82	158	9.57	9.87	10.42	8.52	9.86	10.03	9.74	166	9.46	9.80	10.29	8.53	9.86	10.03	9.68	184
SE22	9.54	10.06	10.70	10.30	9.51	9.13	9.90	137	9.52	9.88	10.50	10.24	9.51	9.13	9.83	145	9.45	9.83	10.39	10.14	9.51	9.13	9.78	165
SE23	9.54	9.32	10.12	9.23	9.45	10.03	9.65	197	9.58	9.05	9.86	9.10	9.45	10.03	9.55	204	9.47	9.03	9.77	9.07	9.45	10.03	9.51	213
SE31	9.63	9.74	10.23	8.37	9.57	10.67	9.72	184	9.65	9.52	9.99	8.31	9.57	10.67	9.64	191	9.49	9.47	9.86	8.34	9.57	10.67	9.58	205
SE32	9.62	9.56	10.47	8.23	9.68	10.07	9.62	202	9.58	9.31	10.23	8.17	9.68	10.07	9.52	208	9.44	9.20	10.05	8.21	9.68	10.07	9.45	218
SE33	9.74	9.20	10.59	8.18	9.55	10.04	9.56	210	9.67	8.98	10.38	8.16	9.55	10.04	9.48	213	9.58	8.92	10.22	8.20	9.55	10.04	9.42	219
SI01	9.64	9.26	7.95	9.27	11.28	9.99	9.56	211	9.72	9.29	7.88	9.38	11.28	9.99	9.58	198	9.75	9.54	8.24	9.37	11.28	9.99	9.69	181
SI02	9.72	8.27	6.92	8.55	10.02	9.93	8.87	253	9.78	8.31	6.81	8.50	10.02	9.93	8.85	253	9.82	8.64	7.21	8.50	10.02	9.93	8.99	251
SK01	9.78	10.99	10.43	10.58	9.20	10.21	10.23	86	9.86	10.97	10.33	10.74	9.20	10.21	10.25	82	9.96	11.05	10.44	10.67	9.20	10.21	10.29	82
SK02	9.78	10.80	10.23	11.32	9.83	9.66	10.30	80	9.83	10.80	10.12	11.54	9.83	9.66	10.32	78	9.93	10.87	10.17	11.42	9.83	9.66	10.35	75
SK03	9.65	9.94	9.02	9.29	9.83	10.24	9.70	188	9.72	9.95	8.92	9.30	9.83	10.24	9.70	178	9.75	10.04	8.99	9.25	9.83	10.24	9.72	176
SK04	9.62	10.14	9.26	9.89	9.71	9.90	9.79	165	9.69	10.17	9.18	9.86	9.71	9.90	9.79	151	9.75	10.20	9.18	9.78	9.71	9.90	9.79	160
UKC1	9.22	8.83	9.56	10.00	9.21	10.13	9.52	214	9.22	8.69	9.52	9.14	9.21	10.13	9.35	222	9.28	8.83	9.53	9.00	9.21	10.13	9.36	227
UKC2	9.19	8.79	9.53	9.57	9.18	10.28	9.45	221	9.17	8.56	9.41	8.97	9.18	10.28	9.29	227	9.25	8.69	9.43	8.93	9.18	10.28	9.32	228
UKD1	9.24	7.15	8.36	8.26	9.68	10.23	8.80	254	9.21	6.77	8.08	8.21	9.68	10.23	8.66	255	9.30	6.93	8.13	8.24	9.68	10.23	8.71	255

	Baseline period								Scenario period 2011-40								Scenario period 2041-70							
ID	DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	**Rank**	DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	**Rank**	DE_CDDMAX	DE_ARID	DE_PRECgr	DS_AGRI	DS_EMPL	DS_SOIL	D_Impact	**Rank**
UKD2	9.34	9.31	9.94	9.24	9.18	11.02	9.70	190	9.33	9.18	9.88	9.14	9.18	11.02	9.64	188	9.44	9.25	9.92	9.04	9.18	11.02	9.66	188
UKD3	9.33	8.73	9.43	8.53	9.13	10.67	9.32	230	9.32	8.54	9.26	8.30	9.13	10.67	9.21	232	9.42	8.66	9.32	8.30	9.13	10.67	9.25	234
UKD4	9.29	7.68	8.76	8.83	9.20	10.43	9.03	249	9.25	7.38	8.52	8.67	9.20	10.43	8.90	251	9.38	7.56	8.58	8.62	9.20	10.43	8.95	252
UKD5	9.35	9.15	9.99	9.38	9.11	11.33	9.74	179	9.34	8.94	9.85	8.95	9.11	11.33	9.60	194	9.44	9.03	9.89	8.52	9.11	11.33	9.55	209
UKE1	9.47	10.17	10.42	11.84	9.39	9.36	10.12	102	9.45	10.08	10.38	11.92	9.39	9.36	10.11	97	9.52	10.20	10.39	12.20	9.39	9.36	10.14	102
UKE2	9.32	9.17	9.70	10.46	9.56	10.27	9.78	168	9.32	9.04	9.70	9.98	9.56	10.27	9.68	182	9.39	9.15	9.69	9.86	9.56	10.27	9.69	182
UKE3	9.41	9.76	10.03	10.39	9.13	11.06	9.99	123	9.42	9.68	10.04	9.87	9.13	11.06	9.89	129	9.49	9.73	10.03	9.70	9.13	11.06	9.89	136
UKE4	9.27	9.02	9.46	9.29	9.13	10.83	9.52	213	9.28	8.89	9.45	8.86	9.13	10.83	9.43	217	9.35	8.97	9.47	8.66	9.13	10.83	9.41	222
UKF1	9.42	9.71	9.91	10.38	9.18	10.65	9.91	135	9.45	9.64	9.95	10.12	9.18	10.65	9.87	138	9.55	9.69	9.97	10.01	9.18	10.65	9.88	138
UKF2	9.49	10.37	10.42	11.76	9.21	10.05	10.23	85	9.52	10.33	10.45	11.80	9.21	10.05	10.24	84	9.66	10.38	10.49	11.65	9.21	10.05	10.27	86
UKF3	9.50	10.35	10.53	11.84	9.81	10.51	10.45	62	9.55	10.28	10.52	11.92	9.81	10.51	10.45	61	9.60	10.35	10.54	12.88	9.81	10.51	10.48	62
UKG1	9.43	9.94	10.15	10.93	9.41	9.42	9.91	134	9.52	9.92	10.24	10.64	9.41	9.42	9.89	130	9.63	10.00	10.32	10.52	9.41	9.42	9.92	128
UKG2	9.33	9.65	9.96	9.97	9.36	10.50	9.83	157	9.40	9.59	10.00	9.64	9.36	10.50	9.79	154	9.51	9.66	10.05	9.58	9.36	10.50	9.81	155
UKG3	9.43	10.07	10.17	8.90	9.13	10.70	9.76	172	9.50	10.05	10.23	8.71	9.13	10.70	9.74	165	9.64	10.12	10.30	8.70	9.13	10.70	9.78	164
UKH1	9.51	10.53	10.71	11.84	9.44	10.95	10.51	55	9.58	10.49	10.69	11.92	9.44	10.95	10.53	54	9.69	10.56	10.76	12.52	9.44	10.95	10.57	55
UKH2	9.57	10.39	10.48	11.84	9.13	10.58	10.34	74	9.66	10.37	10.51	11.68	9.13	10.58	10.34	77	9.79	10.46	10.59	11.35	9.13	10.58	10.35	76
UKH3	9.58	10.52	10.64	11.84	9.14	10.54	10.39	69	9.65	10.50	10.65	11.92	9.14	10.54	10.41	67	9.79	10.57	10.73	11.79	9.14	10.54	10.45	64
UKI1	9.62	10.32	10.44	8.14	9.08	10.14	9.63	201	9.69	10.28	10.47	8.14	9.08	10.14	9.64	190	9.86	10.37	10.55	8.19	9.08	10.14	9.70	180
UKI2	9.62	10.29	10.45	8.64	9.09	10.14	9.73	181	9.68	10.24	10.45	8.38	9.09	10.14	9.68	183	9.85	10.34	10.55	8.29	9.09	10.14	9.71	177
UKJ1	9.57	10.29	10.40	11.47	9.22	9.99	10.18	95	9.62	10.26	10.44	11.40	9.22	9.99	10.18	88	9.78	10.35	10.54	11.22	9.22	9.99	10.22	90
UKJ2	9.62	9.79	10.32	9.79	9.22	9.15	9.69	194	9.72	9.73	10.32	9.94	9.22	9.15	9.72	171	9.89	9.87	10.47	9.86	9.22	9.15	9.78	166
UKJ3	9.67	9.88	10.38	10.77	9.22	9.11	9.87	148	9.73	9.84	10.40	10.86	9.22	9.11	9.89	131	9.90	9.99	10.55	10.75	9.22	9.11	9.95	125
UKJ4	9.57	10.03	10.46	11.06	9.26	9.76	10.05	113	9.66	10.00	10.44	10.93	9.26	9.76	10.04	109	9.82	10.12	10.56	10.69	9.26	9.76	10.08	110
UKK1	9.52	9.93	10.22	10.65	9.25	9.30	9.84	153	9.65	9.93	10.31	10.39	9.25	9.30	9.84	141	9.77	10.05	10.43	10.33	9.25	9.30	9.89	135
UKK2	9.57	9.61	10.15	9.66	9.55	9.99	9.80	164	9.70	9.61	10.26	9.51	9.55	9.99	9.81	147	9.81	9.74	10.39	9.47	9.55	9.99	9.86	145
UKK3	9.56	8.28	9.75	9.23	9.72	10.69	9.56	212	9.60	8.33	9.83	9.06	9.72	10.69	9.55	203	9.76	8.51	9.90	9.06	9.72	10.69	9.62	197
UKK4	9.54	8.83	9.82	8.81	9.47	10.40	9.51	217	9.65	8.88	9.96	8.51	9.47	10.40	9.50	211	9.75	9.04	10.05	8.53	9.47	10.40	9.56	208
UKL1	9.32	7.81	9.15	8.26	9.54	10.08	9.03	250	9.35	7.71	9.13	8.22	9.54	10.08	9.01	246	9.50	7.90	9.25	8.26	9.54	10.08	9.09	245
UKL2	9.27	8.24	8.99	8.36	9.40	10.15	9.09	245	9.32	8.20	9.08	8.27	9.40	10.15	9.08	241	9.43	8.34	9.18	8.31	9.40	10.15	9.14	243
UKM2	9.20	7.76	9.07	9.52	9.42	10.51	9.25	236	9.17	7.52	8.93	8.95	9.42	10.51	9.08	242	9.24	7.63	8.94	8.94	9.42	10.51	9.11	244
UKM3	9.19	6.74	8.42	8.29	9.29	10.31	8.67	257	9.17	6.41	8.17	8.23	9.29	10.31	8.54	257	9.25	6.52	8.23	8.26	9.29	10.31	8.59	258
UKM5	9.21	8.80	9.93	10.04	9.52	10.51	9.70	189	9.20	8.61	9.79	9.65	9.52	10.51	9.57	199	9.22	8.72	9.81	9.60	9.52	10.51	9.59	203
UKM6	9.05	6.57	7.87	8.23	9.67	11.28	8.69	256	9.01	6.41	7.62	8.19	9.67	11.28	8.60	256	9.08	6.52	7.67	8.23	9.67	11.28	8.64	256
UKN0	9.12	7.64	8.80	8.32	9.66	11.08	9.08	246	9.11	7.51	8.68	8.25	9.66	11.08	9.02	245	9.20	7.62	8.79	8.28	9.66	11.08	9.07	247

Table B.4: Forest fire danger – normalised (shifted by 10) individual input parameters as well as final impact indicator for baseline period, scenario period 2011-40 and scenario period 2041-70, for each NUTS-2 region. Furthermore, the NUTS-2 ranking is given (1 = highest impact, 261 = lowest impact; light grey = regions within 4th quartile of baseline; dark grey = regions additionally within the 1st quartile of adaptive capacity, i.e. vulnerability hotspot regions).

	Baseline period								Scenario period 2011-40								Scenario period 2041-70							
ID	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	Rank	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	Rank	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	Rank
AT11	9.75	10.58	9.46	9.93	10.32	11.12	10.23	65	9.78	10.90	9.31	9.99	10.32	11.12	10.27	69	9.86	11.30	9.50	10.07	10.32	11.12	10.39	73
AT12	9.62	10.07	9.29	10.38	10.24	10.78	10.10	86	9.64	10.39	9.20	10.56	10.24	10.78	10.17	80	9.72	10.77	9.33	10.76	10.24	10.78	10.30	84
AT13	9.71	10.69	9.85	9.25	10.31	9.77	9.96	120	9.76	10.98	9.73	9.25	10.31	9.77	10.00	123	9.85	11.35	9.85	9.24	10.31	9.77	10.09	131
AT21	9.58	8.73	7.01	11.65	8.71	10.11	9.23	237	9.60	9.19	6.81	11.78	8.71	10.11	9.28	238	9.61	9.70	7.16	11.88	8.71	10.11	9.46	236
AT22	9.47	9.01	7.01	11.52	8.56	10.33	9.25	236	9.48	9.41	6.81	11.62	8.56	10.33	9.29	237	9.51	9.86	7.16	11.70	8.56	10.33	9.45	237
AT31	9.36	9.61	7.95	10.37	9.15	10.35	9.47	220	9.36	9.94	7.82	10.85	9.15	10.35	9.57	217	9.39	10.33	8.03	10.96	9.15	10.35	9.69	210
AT32	9.23	8.00	7.01	11.45	7.99	9.99	8.87	252	9.25	8.48	6.81	11.55	7.99	9.99	8.93	253	9.26	8.98	7.16	11.67	7.99	9.99	9.10	250
AT33	9.38	7.46	7.01	11.19	7.49	9.60	8.60	260	9.39	8.03	6.81	11.28	7.49	9.60	8.68	260	9.41	8.62	7.16	11.38	7.49	9.60	8.87	257
AT34	9.40	8.31	7.01	11.37	8.05	9.80	8.92	250	9.41	8.80	6.81	11.49	8.05	9.80	8.98	251	9.48	9.34	7.16	11.56	8.05	9.80	9.17	249
BE10	9.45	9.84	9.68	8.87	11.09	11.10	10.02	100	9.52	10.08	9.77	8.87	11.09	11.10	10.09	103	9.67	10.42	9.97	8.87	11.09	11.10	10.20	110
BE21	9.44	9.79	9.66	9.08	11.04	10.50	9.94	127	9.51	10.03	9.71	9.14	11.04	10.50	10.02	119	9.67	10.34	9.88	9.40	11.04	10.50	10.17	115
BE22	9.44	9.78	9.60	9.28	10.97	10.37	9.94	131	9.47	10.03	9.64	9.45	10.97	10.37	10.02	118	9.62	10.38	9.86	9.56	10.97	10.37	10.16	116
BE23	9.45	9.74	9.71	8.54	11.25	10.43	9.86	160	9.52	9.97	9.77	8.55	11.25	10.43	9.93	152	9.68	10.28	9.96	8.78	11.25	10.43	10.08	133
BE24	9.43	9.78	9.71	8.84	11.20	10.73	9.96	122	9.48	10.02	9.76	8.86	11.20	10.73	10.02	115	9.66	10.35	9.96	8.88	11.20	10.73	10.15	119
BE25	9.51	9.66	10.10	8.36	11.21	10.36	9.87	156	9.59	9.89	10.16	8.36	11.21	10.36	9.94	147	9.73	10.19	10.32	8.44	11.21	10.36	10.05	142
BE31	9.41	9.63	9.68	8.72	11.11	10.63	9.88	155	9.45	9.88	9.77	8.73	11.11	10.63	9.94	145	9.65	10.23	9.97	8.79	11.11	10.63	10.08	132
BE32	9.44	9.41	9.77	8.94	11.04	10.39	9.85	162	9.50	9.67	9.84	9.00	11.04	10.39	9.93	149	9.71	10.01	10.03	9.09	11.04	10.39	10.07	136
BE33	9.36	9.49	9.11	9.90	10.57	9.82	9.74	176	9.35	9.76	9.08	10.01	10.57	9.82	9.80	173	9.53	10.14	9.43	10.33	10.57	9.82	10.01	155
BE34	9.34	9.36	9.53	10.98	10.74	10.17	10.04	96	9.36	9.65	9.51	11.22	10.74	10.17	10.13	87	9.55	10.06	9.85	11.43	10.74	10.17	10.33	78
BE35	9.39	9.48	9.55	10.10	10.86	10.34	9.98	111	9.42	9.74	9.60	10.29	10.86	10.34	10.08	104	9.61	10.11	9.85	10.60	10.86	10.34	10.27	91
BG31	10.50	11.18	10.38	9.84	8.34	10.84	10.18	75	10.86	11.77	10.67	9.61	8.34	10.84	10.34	65	11.15	12.32	10.93	9.59	8.34	10.84	10.50	66
BG32	10.73	11.49	10.57	9.87	8.34	11.32	10.38	57	10.97	12.07	10.87	9.64	8.34	11.32	10.51	58	11.29	12.60	11.11	9.62	8.34	11.32	10.67	58
BG33	10.92	11.27	10.86	9.70	8.34	11.52	10.42	55	11.25	11.83	11.12	9.40	8.34	11.52	10.54	56	11.48	12.32	11.33	9.38	8.34	11.52	10.68	57
BG34	11.02	11.47	11.04	10.50	8.34	11.01	10.56	43	11.39	12.06	11.21	10.35	8.34	11.01	10.71	44	11.76	12.61	11.47	10.32	8.34	11.01	10.88	47
BG41	10.36	10.08	10.46	11.65	8.34	10.34	10.20	69	10.63	10.80	10.61	11.63	8.34	10.34	10.39	62	11.01	11.48	11.00	11.62	8.34	10.34	10.62	61
BG42	10.87	11.05	10.88	11.31	8.34	10.59	10.50	47	11.18	11.70	11.03	11.21	8.34	10.59	10.66	47	11.69	12.32	11.35	11.21	8.34	10.59	10.89	46
CY00	13.00	12.85	12.06	10.45	10.67	9.77	11.46	4	13.83	13.35	12.02	10.21	10.67	9.77	11.60	5	14.55	13.85	12.15	10.23	10.67	9.77	11.79	8
CZ01	9.71	10.32	10.06	8.79	11.02	11.51	10.24	64	9.66	10.59	9.76	8.47	11.02	11.51	10.17	81	9.65	10.95	9.82	8.50	11.02	11.51	10.23	99
CZ02	9.62	10.10	9.91	9.87	10.45	11.06	10.20	68	9.56	10.39	9.63	9.53	10.45	11.06	10.13	86	9.59	10.75	9.72	9.62	10.45	11.06	10.23	100
CZ03	9.46	9.58	9.42	10.48	10.12	10.74	10.00	108	9.44	9.90	9.21	10.22	10.12	10.74	9.97	133	9.49	10.28	9.36	10.29	10.12	10.74	10.08	134
CZ04	9.49	9.64	9.84	10.55	10.12	10.15	10.00	105	9.49	9.94	9.57	10.41	10.12	10.15	9.99	126	9.51	10.34	9.71	10.51	10.12	10.15	10.10	128
CZ05	9.52	9.65	9.53	10.20	10.40	10.51	10.01	102	9.48	9.95	9.19	9.86	10.40	10.51	9.93	148	9.52	10.29	9.29	9.95	10.40	10.51	10.03	148
CZ06	9.69	9.91	9.72	9.91	10.41	11.07	10.15	78	9.70	10.23	9.51	9.67	10.41	11.07	10.13	89	9.75	10.59	9.60	9.74	10.41	11.07	10.23	102
CZ07	9.56	9.63	9.19	10.44	9.74	10.55	9.89	151	9.59	9.96	8.97	10.37	9.74	10.55	9.90	156	9.67	10.30	9.08	10.46	9.74	10.55	10.00	157
CZ08	9.45	9.52	8.79	10.34	9.83	10.64	9.79	171	9.46	9.85	8.64	10.03	9.83	10.64	9.77	183	9.51	10.17	8.79	10.10	9.83	10.64	9.87	185
DE11	9.46	9.79	9.11	9.95	10.75	10.27	9.92	137	9.46	10.12	9.01	10.10	10.75	10.27	9.98	132	9.59	10.56	9.27	10.18	10.75	10.27	10.14	123
DE12	9.42	9.97	8.94	10.67	10.68	10.10	9.99	109	9.42	10.31	8.94	10.84	10.68	10.10	10.07	105	9.57	10.75	9.13	10.95	10.68	10.10	10.22	103
DE13	9.36	9.71	8.38	10.73	10.61	10.21	9.84	163	9.36	10.09	8.41	11.10	10.61	10.21	9.97	134	9.50	10.58	8.69	11.41	10.61	10.21	10.17	114
DE14	9.36	9.58	8.15	10.02	10.58	10.22	9.66	196	9.35	9.96	8.02	10.35	10.58	10.22	9.75	187	9.45	10.45	8.37	10.63	10.58	10.22	9.96	165
DE21	9.32	9.54	7.34	10.16	9.90	10.34	9.42	230	9.32	9.92	7.15	10.55	9.90	10.34	9.50	225	9.37	10.37	7.48	10.82	9.90	10.34	9.69	212
DE22	9.38	9.71	8.75	9.96	10.80	10.56	9.88	154	9.38	10.04	8.56	10.45	10.80	10.56	9.98	131	9.44	10.43	8.75	10.79	10.80	10.56	10.14	120
DE23	9.49	9.58	9.28	10.53	10.57	10.78	10.07	91	9.47	9.91	9.08	10.79	10.57	10.78	10.12	91	9.56	10.32	9.23	10.99	10.57	10.78	10.27	89
DE24	9.56	9.49	9.70	10.32	10.79	10.66	10.12	84	9.55	9.79	9.50	10.57	10.79	10.66	10.18	79	9.63	10.20	9.69	10.80	10.79	10.66	10.33	77
DE25	9.48	9.78	9.47	10.04	10.83	10.77	10.09	87	9.46	10.10	9.32	10.11	10.83	10.77	10.13	90	9.60	10.53	9.54	10.16	10.83	10.77	10.27	87
DE26	9.49	9.86	9.76	10.45	10.41	9.70	9.98	113	9.50	10.16	9.67	10.64	10.41	9.70	10.05	108	9.61	10.58	9.87	10.78	10.41	9.70	10.19	111
DE27	9.36	9.43	7.58	9.86	9.90	10.43	9.42	228	9.34	9.81	7.49	10.04	9.90	10.43	9.49	228	9.43	10.27	7.84	10.26	9.90	10.43	9.69	215
DE30	9.53	10.17	10.24	9.29	10.87	10.74	10.17	76	9.51	10.41	10.07	9.29	10.87	10.74	10.18	78	9.63	10.73	10.14	9.29	10.87	10.74	10.26	92
DE41	9.51	9.94	10.33	10.05	10.17	10.61	10.14	80	9.51	10.18	10.17	10.08	10.17	10.61	10.16	83	9.59	10.48	10.22	10.12	10.17	10.61	10.24	97
DE42	9.53	10.14	10.27	10.38	10.19	10.60	10.23	66	9.50	10.38	10.06	10.39	10.19	10.60	10.23	76	9.60	10.71	10.17	10.41	10.19	10.60	10.32	80
DE50	9.36	9.71	9.64	8.40	10.80	10.35	9.72	181	9.38	9.93	9.59	8.40	10.80	10.35	9.75	186	9.47	10.21	9.73	8.36	10.80	10.35	9.83	191
DE60	9.40	9.67	9.57	8.60	10.27	9.94	9.60	206	9.41	9.89	9.43	8.61	10.27	9.94	9.62	211	9.50	10.16	9.63	8.60	10.27	9.94	9.71	206
DE71	9.47	10.06	9.69	10.48	10.59	9.87	10.07	92	9.45	10.36	9.65	10.60	10.59	9.87	10.12	93	9.58	10.78	9.88	10.68	10.59	9.87	10.27	90
DE72	9.39	9.71	9.49	10.41	10.52	9.72	9.91	138	9.36	10.00	9.40	10.54	10.52	9.72	9.96	137	9.50	10.41	9.69	10.63	10.52	9.72	10.11	124
DE73	9.37	9.61	9.44	10.45	10.51	9.58	9.86	161	9.36	9.89	9.38	10.85	10.51	9.58	9.96	138	9.43	10.28	9.63	11.08	10.51	9.58	10.11	125
DE80	9.46	9.68	10.23	9.42	10.23	10.12	9.90	143	9.49	9.91	10.08	9.50	10.23	10.12	9.93	150	9.54	10.19	10.10	9.57	10.23	10.12	10.00	158
DE91	9.34	9.61	9.57	10.05	10.24	9.72	9.79	169	9.35	9.85	9.42	10.27	10.24	9.72	9.85	171	9.41	10.18	9.57	10.41	10.24	9.72	9.96	166
DE92	9.34	9.71	9.65	9.33	10.28	9.42	9.66	198	9.35	9.93	9.57	9.52	10.28	9.42	9.72	195	9.47	10.24	9.78	9.65	10.28	9.42	9.85	189
DE93	9.36	9.69	9.63	9.61	10.28	10.43	9.87	159	9.38	9.91	9.52	9.66	10.28	10.43	9.90	155	9.47	10.19	9.68	9.83	10.28	10.43	10.02	151
DE94	9.37	9.67	9.63	8.81	10.60	9.97	9.70	185	9.38	9.90	9.60	8.85	10.60	9.97	9.75	188	9.50	10.19	9.76	8.91	10.60	9.97	9.85	186
DEA1	9.43	9.90	9.59	8.98	10.91	9.97	9.82	166	9.43	10.14	9.53	9.15	10.91	9.97	9.88	160	9.60	10.49	9.76	9.41	10.91	9.97	10.05	141
DEA2	9.35	9.78	9.12	9.71	10.77	10.14	9.84	164	9.33	10.04	9.06	9.77	10.77	10.14	9.88	163	9.51	10.43	9.39	9.84	10.77	10.14	10.04	144
DEA3	9.39	9.82	9.70	8.89	10.93	10.35	9.87	158	9.39	10.05	9.64	9.51	10.93	10.35	10.01	121	9.53	10.39	9.84	10.22	10.93	10.35	10.25	95
DEA4	9.31	9.67	9.47	9.35	10.66	9.69	9.73	180	9.30	9.91	9.38	9.57	10.66	9.69	9.79	177	9.43	10.25	9.63	9.85	10.66	9.69	9.96	167
DEA5	9.31	9.52	9.15	10.45	10.66	10.09	9.89	145	9.29	9.78	9.11	10.68	10.66	10.09	9.96	136	9.42	10.15	9.38	10.77	10.66	10.09	10.11	127
DEB1	9.34	9.77	9.38	10.67	10.83	10.14	10.05	95	9.34	10.07	9.30	11.06	10.83	10.14	10.15	84	9.51	10.49	9.61	11.19	10.83	10.14	10.33	79
DEB2	9.32	9.55	9.61	10.49	10.86	10.00	10.01	104	9.33	9.87	9.57	10.86	10.86	10.00	10.11	96	9.52	10.31	9.89	10.99	10.86	10.00	10.30	85
DEB3	9.44	10.06	9.73	10.19	10.57	10.15	10.06	93	9.41	10.37	9.71	10.41	10.57	10.15	10.14	85	9.58	10.82	9.93	10.52	10.57	10.15	10.30	83
DEC0	9.48	9.81	9.75	10.16	10.84	9.76	10.00	106	9.46	10.14	9.74	10.50	10.84	9.76	10.11	98	9.68	10.59	10.04	10.70	10.84	9.76	10.31	81

ID	Baseline period								Scenario period 2011-40								Scenario period 2041-70							
	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	Rank	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	Rank	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	Rank
DED1	9.49	9.52	9.56	9.89	10.57	10.68	9.98	112	9.48	9.80	9.31	10.23	10.57	10.68	10.05	109	9.51	10.18	9.48	10.50	10.57	10.68	10.19	113
DED2	9.51	10.00	9.92	9.93	10.45	10.41	10.08	90	9.48	10.26	9.64	10.12	10.45	10.41	10.10	99	9.51	10.61	9.80	10.25	10.45	10.41	10.21	109
DED3	9.64	10.15	10.16	9.06	10.60	10.96	10.12	83	9.60	10.38	9.92	9.08	10.60	10.96	10.12	94	9.66	10.73	10.06	9.14	10.60	10.96	10.22	104
DEE0	9.51	9.90	10.18	9.49	10.00	10.46	9.96	121	9.50	10.14	10.04	9.51	10.00	10.46	9.98	130	9.58	10.47	10.14	9.54	10.00	10.46	10.07	137
DEF0	9.33	9.51	9.61	8.76	10.72	10.00	9.68	193	9.38	9.74	9.49	8.84	10.72	10.00	9.72	193	9.39	10.01	9.63	8.94	10.72	10.00	9.81	195
DEG0	9.49	9.57	9.79	10.08	10.37	10.22	9.96	123	9.48	9.84	9.65	10.34	10.37	10.22	10.02	116	9.54	10.22	9.86	10.49	10.37	10.22	10.16	117
DK01	9.49	9.63	10.15	9.23	10.63	9.00	9.72	184	9.51	9.91	10.04	9.36	10.63	9.00	9.77	181	9.44	10.19	10.01	9.40	10.63	9.00	9.81	196
DK02	9.48	9.52	10.36	8.88	10.47	9.05	9.65	201	9.52	9.80	10.24	8.98	10.47	9.05	9.70	199	9.48	10.11	10.24	9.15	10.47	9.05	9.78	198
DK03	9.35	9.27	9.86	8.79	10.63	9.19	9.54	212	9.39	9.52	9.78	8.83	10.63	9.19	9.58	214	9.37	9.80	9.89	8.87	10.63	9.19	9.65	218
DK04	9.38	9.30	10.09	9.09	10.56	9.71	9.72	182	9.42	9.57	10.02	9.16	10.56	9.71	9.77	180	9.38	9.85	10.09	9.29	10.56	9.71	9.85	188
DK05	9.45	9.25	10.11	8.96	10.44	8.50	9.47	219	9.51	9.54	10.02	9.09	10.44	8.50	9.54	221	9.43	9.82	10.06	9.27	10.44	8.50	9.61	224
EE00	9.59	9.41	9.73	11.43	9.35	8.90	9.75	174	9.59	9.77	9.49	11.24	9.35	8.90	9.74	189	9.46	9.99	9.28	11.03	9.35	8.90	9.69	211
ES11	10.36	10.23	10.85	11.19	10.48	11.05	10.74	38	10.82	10.67	11.21	11.46	10.48	11.05	11.00	34	11.13	11.10	11.44	11.64	10.48	11.05	11.19	36
ES12	10.07	10.16	10.94	10.52	9.79	10.99	10.45	53	10.36	10.54	11.19	10.67	9.79	10.99	10.63	51	10.63	10.95	11.35	11.16	9.79	10.99	10.85	50
ES13	9.69	9.87	10.35	10.43	9.58	11.13	10.21	67	9.94	10.22	10.65	10.51	9.58	11.13	10.37	63	10.15	10.59	10.88	10.92	9.58	11.13	10.58	63
ES21	9.67	10.24	10.13	11.45	9.84	10.84	10.39	56	9.91	10.60	10.42	11.53	9.84	10.84	10.56	54	10.15	11.01	10.67	11.75	9.84	10.84	10.74	54
ES22	10.05	10.61	10.57	10.94	9.61	10.88	10.48	50	10.28	11.04	10.79	11.03	9.61	10.88	10.64	50	10.68	11.51	11.00	11.17	9.61	10.88	10.84	51
ES23	10.30	10.48	11.04	10.85	9.03	11.10	10.49	49	10.64	10.94	11.19	11.10	9.03	11.10	10.69	46	11.05	11.43	11.33	11.35	9.03	11.10	10.90	45
ES24	10.78	11.02	11.09	10.76	8.86	10.23	10.48	51	11.09	11.58	11.19	10.86	8.86	10.23	10.65	49	11.55	12.16	11.28	11.05	8.86	10.23	10.85	49
ES30	11.78	11.61	11.70	10.86	9.80	10.60	11.09	21	12.14	12.28	11.78	10.90	9.80	10.60	11.27	19	12.64	12.92	11.85	11.04	9.80	10.60	11.48	22
ES41	11.07	10.53	11.38	10.56	9.59	11.36	10.78	37	11.51	11.12	11.51	10.60	9.59	11.36	10.98	35	11.96	11.69	11.64	10.78	9.59	11.36	11.20	35
ES42	12.06	11.78	11.72	10.35	8.74	10.91	10.92	29	12.40	12.41	11.79	10.41	8.74	10.91	11.08	31	12.98	13.01	11.85	10.53	8.74	10.91	11.29	31
ES43	13.00	12.36	11.91	10.47	8.70	11.65	11.31	10	13.64	13.00	11.98	10.52	8.70	11.65	11.51	12	14.27	13.57	12.07	10.66	8.70	11.65	11.73	12
ES51	10.68	10.87	10.80	11.10	9.46	10.82	10.66	42	10.97	11.42	10.92	11.29	9.46	10.82	10.85	41	11.29	12.01	11.03	11.54	9.46	10.82	11.05	42
ES52	12.15	11.72	11.69	10.90	9.27	10.16	10.99	27	12.51	12.23	11.71	11.14	9.27	10.16	11.16	28	13.01	12.74	11.78	11.40	9.27	10.16	11.37	29
ES53	12.28	11.77	11.85	10.13	9.97	10.66	11.13	19	12.51	12.18	11.87	10.27	9.97	10.66	11.26	21	13.04	12.60	11.93	10.50	9.97	10.66	11.45	25
ES61	13.00	12.19	11.94	10.18	8.31	10.84	11.01	25	13.83	12.76	11.99	10.35	8.31	10.84	11.26	22	14.55	13.28	12.04	10.66	8.31	10.84	11.49	21
ES62	13.00	12.17	11.87	10.01	9.26	9.39	10.90	31	13.31	12.66	11.90	10.14	9.26	9.39	11.05	32	13.98	13.14	11.93	10.40	9.26	9.39	11.26	32
FI13	9.49	8.90	9.68	12.20	9.78	9.30	9.61	204	9.53	9.38	9.57	12.29	9.78	9.30	9.73	191	9.40	9.70	9.38	12.33	9.78	9.30	9.76	202
FI18	9.59	9.24	9.84	11.60	10.23	10.01	9.89	148	9.63	9.67	9.67	11.64	10.23	10.01	9.98	129	9.49	9.97	9.47	11.63	10.23	10.01	10.00	156
FI19	9.58	8.86	9.78	12.03	10.10	9.43	9.69	190	9.58	9.27	9.58	12.14	10.10	9.43	9.77	182	9.50	9.59	9.45	12.20	10.10	9.43	9.82	194
FI1A	9.81	8.17	10.04	12.22	6.84	8.19	8.77	256	9.79	8.70	9.84	12.25	6.84	8.19	8.88	255	9.69	9.13	9.81	12.27	6.84	8.19	8.97	254
FI20	9.64	9.19	10.40	12.25	8.88	9.45	9.70	186	9.63	9.84	10.20	12.65	8.88	9.45	9.86	167	9.55	10.36	10.15	12.66	8.88	9.45	9.96	164
FR10	9.66	10.27	10.47	9.51	10.95	10.88	10.32	60	9.75	10.58	10.59	9.58	10.95	10.88	10.42	61	10.02	10.99	10.83	9.65	10.95	10.88	10.59	62
FR21	9.52	10.04	10.00	9.75	10.40	9.90	9.98	115	9.58	10.35	10.06	10.01	10.40	9.90	10.09	101	9.82	10.78	10.33	10.18	10.40	9.90	10.28	86
FR22	9.56	9.79	10.25	9.17	10.91	9.77	9.94	130	9.63	10.06	10.36	9.41	10.91	9.77	10.06	107	9.85	10.44	10.58	9.62	10.91	9.77	10.23	101
FR23	9.55	9.72	10.41	9.22	11.08	9.89	10.01	101	9.65	10.01	10.55	9.30	11.08	9.89	10.11	97	9.89	10.38	10.76	9.37	11.08	9.89	10.26	94
FR24	9.66	10.26	10.52	9.46	10.80	11.17	10.34	59	9.81	10.61	10.65	9.50	10.80	11.17	10.46	59	10.09	11.07	10.90	9.56	10.80	11.17	10.63	59
FR25	9.64	9.66	10.63	8.72	11.02	10.35	10.02	99	9.79	9.95	10.77	8.75	11.02	10.35	10.12	92	10.02	10.32	10.96	8.79	11.02	10.35	10.26	93
FR26	9.51	10.19	9.98	9.89	10.75	10.27	10.14	82	9.59	10.54	10.06	10.03	10.75	10.27	10.25	75	9.84	11.03	10.33	10.15	10.75	10.27	10.44	70
FR30	9.49	9.57	10.16	8.66	10.89	10.08	9.83	165	9.56	9.83	10.23	8.71	10.89	10.08	9.91	154	9.74	10.16	10.42	8.79	10.89	10.08	10.04	146
FR41	9.45	9.87	9.52	10.26	10.52	9.97	9.97	119	9.44	10.20	9.55	10.46	10.52	9.97	10.06	106	9.66	10.64	9.84	10.59	10.52	9.97	10.24	96
FR42	9.38	10.17	9.03	10.41	10.58	9.84	9.93	133	9.39	10.51	9.14	10.62	10.58	9.84	10.04	110	9.56	10.97	9.36	10.80	10.58	9.84	10.21	107
FR43	9.43	9.92	8.94	10.70	10.76	9.65	9.92	135	9.49	10.29	9.09	10.80	10.76	9.65	10.04	111	9.69	10.76	9.40	10.83	10.76	9.65	10.21	108
FR51	9.80	10.24	10.76	8.73	11.00	10.56	10.20	70	9.99	10.61	10.95	8.80	11.00	10.56	10.34	64	10.32	11.04	11.15	8.96	11.00	10.56	10.53	65
FR52	9.69	9.74	10.68	8.89	11.01	10.34	10.08	89	9.91	10.07	10.92	9.29	11.01	10.34	10.29	68	10.13	10.45	11.07	9.62	11.01	10.34	10.47	69
FR53	9.73	10.49	10.60	9.07	11.06	11.18	10.38	58	9.99	10.87	10.81	9.13	11.06	11.18	10.53	57	10.21	11.31	11.01	9.24	11.06	11.18	10.69	56
FR61	9.67	10.66	10.18	10.77	10.50	11.15	10.53	46	9.84	11.06	10.40	10.95	10.50	11.15	10.69	45	10.11	11.49	10.65	11.07	10.50	11.15	10.87	48
FR62	9.78	10.39	10.17	10.07	10.29	10.58	10.26	63	10.00	10.84	10.40	10.26	10.29	10.58	10.44	60	10.31	11.33	10.61	10.38	10.29	10.58	10.63	60
FR63	9.59	10.02	9.97	10.20	11.06	10.10	10.19	71	9.72	10.43	10.18	10.26	11.06	10.10	10.33	66	10.01	10.93	10.50	10.39	11.06	10.10	10.54	64
FR71	9.70	9.77	9.58	10.69	10.17	10.53	10.11	85	9.79	10.23	9.62	11.00	10.17	10.53	10.26	71	10.05	10.79	9.88	11.20	10.17	10.53	10.48	68
FR72	9.56	9.76	9.89	10.04	10.76	10.25	10.08	88	9.66	10.19	10.00	10.23	10.76	10.25	10.22	77	9.93	10.73	10.29	10.36	10.76	10.25	10.43	71
FR81	10.27	10.71	10.72	11.07	10.25	10.80	10.68	41	10.47	11.21	10.81	11.17	10.25	10.80	10.83	42	10.90	11.78	10.95	11.22	10.25	10.80	11.03	43
FR82	10.64	10.24	10.70	11.20	9.34	10.44	10.46	52	10.77	10.79	10.70	11.39	9.34	10.44	10.60	53	11.21	11.41	10.83	11.44	9.34	10.44	10.80	53
FR83	11.41	10.48	11.45	11.51	9.58	10.60	10.87	34	11.57	10.98	11.40	11.56	9.58	10.60	10.98	36	12.18	11.58	11.54	11.60	9.58	10.60	11.20	34
GR11	11.57	11.58	11.50	11.27	10.43	9.76	11.05	22	12.02	12.23	11.55	11.26	10.43	9.76	11.23	24	12.64	12.83	11.80	11.31	10.43	9.76	11.46	23
GR12	11.58	11.98	11.44	10.55	10.86	9.58	11.02	24	12.01	12.63	11.50	10.59	10.86	9.58	11.21	26	12.48	13.24	11.70	10.75	10.86	9.58	11.43	26
GR13	11.14	10.84	11.28	11.28	10.76	8.81	10.70	40	11.47	11.56	11.38	11.37	10.76	8.81	10.90	39	11.88	12.24	11.60	11.56	10.76	8.81	11.13	39
GR14	12.12	11.91	11.68	10.99	10.93	9.29	11.17	18	12.49	12.55	11.73	11.04	10.93	9.29	11.34	18	12.98	13.14	11.87	11.17	10.93	9.29	11.54	18
GR21	11.46	11.31	11.53	12.03	10.89	10.02	11.24	15	11.88	11.95	11.53	12.06	10.89	10.02	11.42	15	12.42	12.56	11.77	12.13	10.89	10.02	11.65	15
GR22	13.00	12.23	11.92	10.77	10.96	9.69	11.43	5	13.83	12.92	11.96	10.91	10.96	9.69	11.69	4	14.55	13.51	12.04	11.17	10.96	9.69	11.94	2
GR23	12.63	11.69	11.86	11.05	10.80	9.25	11.21	16	13.18	12.30	11.88	11.16	10.80	9.25	11.41	16	13.78	12.88	12.00	11.29	10.80	9.25	11.63	17
GR24	12.91	11.74	11.82	11.59	10.80	9.31	11.36	6	13.38	12.39	11.88	11.69	10.80	9.31	11.56	7	13.93	12.99	11.98	11.91	10.80	9.31	11.78	9
GR25	13.00	11.62	11.91	11.54	10.92	9.00	11.32	9	13.60	12.28	11.95	11.74	10.92	9.00	11.54	9	14.35	12.88	12.05	11.96	10.92	9.00	11.80	7
GR30	13.00	12.65	11.99	11.06	10.95	8.38	11.28	14	13.83	13.32	12.06	11.13	10.95	8.38	11.52	11	14.55	13.91	12.12	11.40	10.95	8.38	11.76	10
GR41	13.00	12.39	12.09	11.45	10.57	8.68	11.32	8	13.83	13.06	12.12	11.57	10.57	8.68	11.56	6	14.55	13.69	12.16	11.94	10.57	8.68	11.82	5
GR42	13.00	12.66	12.08	11.79	10.79	7.92	11.28	13	13.83	13.14	12.12	11.86	10.79	7.92	11.49	13	14.55	13.59	12.15	12.11	10.79	7.92	11.69	14
GR43	13.00	12.24	11.92	11.06	10.82	7.46	10.97	28	13.83	12.94	11.91	11.17	10.82	7.46	11.20	27	14.55	13.53	12.03	11.50	10.82	7.46	11.46	24
HU10	10.07	11.08	10.38	9.68	9.33	11.20	10.31	61	10.15	11.45	10.38	9.03	9.33	11.20	10.26	70	10.32	11.84	10.53	9.05	9.33	11.20	10.38	75
HU21	9.91	10.85	10.10	9.67	9.46	10.80	10.17	77	10.00	11.20	10.06	9.32	9.46	10.80	10.16	82	10.13	11.58	10.20	9.35	9.46	10.80	10.27	88
HU22	9.81	10.75	9.71	9.83	9.76	10.84	10.15	79	9.88	11.06	9.58	9.39	9.76	10.84	10.11	95	9.98	11.44	9.74	9.40	9.76	10.84	10.21	106
HU23	9.94	11.00	9.98	9.70	9.44	11.39	10.26	62	10.04	11.36	9.92	9.31	9.44	11.39	10.26	74	10.20	11.76	10.13	9.35	9.44	11.39	10.39	74
HU31	9.99	10.78	10.01	10.08	9.16	10.93	10.19	73	10.11	11.14	9.95	10.10	9.16	10.93	10.26	72	10.19	11.52	10.09	10.14	9.16	10.93	10.36	76
HU32	9.99	11.00	10.04	9.07	9.21	10.28	9.96	125	10.08	11.37	10.03	8.67	9.21	10.28	9.95	143	10.24	11.74	10.15	8.67	9.21	10.28	10.05	143
HU33	10.11	11.11	10.27	9.01	9.05	9.95	9.93	132	10.18	11.50	10.32	8.55	9.05	9.95	9.93	151	10.41	11.89	10.47	8.55	9.05	9.95	10.04	145
IE01	9.12	8.73	9.09	8.95	9.33	7.79	8.86	253	9.15	9.00	9.23	9.01	9.33	7.79	8.94	252	9.25	9.34	9.39	9.01	9.33	7.79	9.04	253
IE02	9.22	8.93	9.27	8.83	9.63	9.20	9.22	239	9.26	9.22	9.48	8.99	9.63	9.20	9.34	236	9.40	9.58	9.60	9.00	9.63	9.20	9.44	239
ITC1	10.28	10.27	9.88	10.58	9.49	10.36	10.18	74	10.39	10.78	9.84	10.76	9.49	10.36	10.31	67	10.57	11.39	10.05	10.89	9.49	10.36	10.49	67

	Baseline period								Scenario period 2011-40								Scenario period 2041-70							
ID	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	Rank	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	Rank	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	Rank
ITC2	9.57	7.22	8.46	10.71	8.49	9.01	8.88	251	9.62	7.98	8.28	10.76	8.49	9.01	9.02	249	9.73	8.80	8.54	10.91	8.49	9.01	9.25	246
ITC3	10.44	10.73	10.37	12.39	10.52	11.30	10.99	26	10.55	11.21	10.29	12.59	10.52	11.30	11.10	30	10.85	11.80	10.47	12.71	10.52	11.30	11.30	30
ITC4	10.15	10.58	9.02	9.94	9.41	10.15	9.91	140	10.23	11.05	8.93	9.98	9.41	10.15	9.98	128	10.34	11.62	9.21	10.05	9.41	10.15	10.15	118
ITD1	9.89	7.70	8.11	11.42	8.81	9.40	9.18	242	9.94	8.31	7.72	11.54	8.81	9.40	9.25	242	9.96	8.95	7.94	11.80	8.81	9.40	9.44	238
ITD2	10.30	8.89	8.36	11.80	8.71	9.82	9.62	203	10.36	9.44	8.09	11.96	8.71	9.82	9.70	200	10.38	10.05	8.47	12.11	8.71	9.82	9.90	177
ITD3	10.15	10.97	9.13	9.64	9.90	9.87	9.97	118	10.25	11.42	8.91	9.68	9.90	9.87	10.02	117	10.36	11.95	9.23	9.76	9.90	9.87	10.19	112
ITD4	9.96	10.37	8.18	10.66	9.37	10.04	9.77	173	10.04	10.81	7.83	10.69	9.37	10.04	9.79	178	10.10	11.32	8.25	10.73	9.37	10.04	9.96	163
ITD5	10.28	11.40	10.15	9.79	10.68	10.49	10.50	48	10.42	11.84	10.03	10.11	10.68	10.49	10.63	52	10.60	12.38	10.26	10.28	10.68	10.49	10.81	52
ITE1	10.39	11.18	10.52	10.92	10.18	11.62	10.84	35	10.54	11.65	10.45	11.01	10.18	11.62	10.95	38	10.91	12.20	10.68	11.30	10.18	11.62	11.18	38
ITE2	10.35	11.09	10.74	10.67	10.09	11.22	10.74	39	10.48	11.58	10.71	10.91	10.09	11.22	10.87	40	10.87	12.15	10.94	11.29	10.09	11.22	11.13	40
ITE3	10.20	11.18	10.30	9.93	10.45	10.99	10.55	44	10.40	11.64	10.29	10.37	10.45	10.99	10.73	43	10.65	12.17	10.49	11.39	10.45	10.99	11.06	41
ITE4	11.17	11.31	11.43	10.09	9.94	10.78	10.82	36	11.35	11.80	11.47	10.25	9.94	10.78	10.96	37	11.81	12.34	11.61	10.60	9.94	10.78	11.20	33
ITF1	10.47	10.53	10.95	10.93	9.93	9.63	10.44	54	10.70	11.05	10.99	11.40	9.93	9.63	10.65	48	11.00	11.64	11.18	11.90	9.93	9.63	10.90	44
ITF2	10.77	11.36	11.29	10.17	10.58	11.06	10.92	30	11.05	11.90	11.38	10.43	10.58	11.06	11.11	29	11.37	12.48	11.54	11.18	10.58	11.06	11.41	28
ITF3	11.13	11.53	11.47	10.31	10.31	11.56	11.09	20	11.45	12.06	11.55	10.45	10.31	11.56	11.27	20	11.81	12.63	11.71	10.77	10.31	11.56	11.50	20
ITF4	11.66	11.97	11.67	8.81	10.11	11.04	10.87	33	11.99	12.48	11.69	8.83	10.11	11.04	11.00	33	12.37	13.01	11.82	8.95	10.11	11.04	11.18	37
ITF5	11.28	11.32	11.56	10.32	10.38	11.13	11.04	23	11.58	11.86	11.63	10.68	10.38	11.13	11.25	23	11.99	12.44	11.77	11.12	10.38	11.13	11.51	19
ITF6	12.15	11.61	11.82	10.71	10.05	11.44	11.33	7	12.56	12.18	11.89	11.06	10.05	11.44	11.56	8	13.10	12.77	11.97	11.38	10.05	11.44	11.80	6
ITG1	13.00	11.90	12.01	9.67	9.99	10.51	11.17	17	13.83	12.45	12.02	10.01	9.99	10.51	11.44	14	14.50	13.01	12.13	10.37	9.99	10.51	11.70	13
ITG2	12.74	11.71	11.93	11.05	9.17	11.12	11.28	12	12.94	12.17	11.92	11.15	9.17	11.12	11.40	17	13.62	12.73	12.02	11.34	9.17	11.12	11.64	16
LT00	9.57	9.58	9.65	10.06	9.40	9.86	9.73	178	9.55	9.89	9.44	9.45	9.40	9.86	9.64	204	9.49	10.08	9.30	9.20	9.40	9.86	9.60	225
LU00	9.39	9.61	9.86	10.29	11.02	9.41	9.96	124	9.42	9.92	9.86	10.73	11.02	9.41	10.09	102	9.63	10.36	10.18	11.04	11.02	9.41	10.30	82
LV00	9.56	9.48	9.70	11.00	9.16	9.11	9.69	188	9.55	9.80	9.45	10.55	9.16	9.11	9.64	205	9.44	9.99	9.26	10.05	9.16	9.11	9.54	231
NL11	9.40	9.46	9.55	8.38	11.00	10.22	9.68	194	9.45	9.68	9.54	8.36	11.00	10.22	9.72	194	9.55	9.95	9.69	8.35	11.00	10.22	9.80	197
NL12	9.40	9.40	9.66	8.48	9.31	10.15	9.43	225	9.49	9.63	9.65	8.48	9.31	10.15	9.48	229	9.57	9.90	9.82	8.47	9.31	10.15	9.56	228
NL13	9.39	9.49	9.60	8.84	10.81	10.13	9.73	177	9.45	9.71	9.60	8.92	10.81	10.13	9.80	175	9.53	9.98	9.78	8.93	10.81	10.13	9.89	179
NL21	9.42	9.58	9.58	8.88	11.14	10.21	9.82	167	9.48	9.80	9.60	8.93	11.14	10.21	9.88	161	9.57	10.10	9.78	8.94	11.14	10.21	9.98	161
NL22	9.45	9.66	9.66	9.27	10.67	10.43	9.89	147	9.48	9.91	9.69	9.33	10.67	10.43	9.95	142	9.61	10.23	9.85	9.34	10.67	10.43	10.06	140
NL23	9.43	9.55	9.60	8.71	10.97	10.07	9.74	175	9.50	9.79	9.61	8.71	10.97	10.07	9.80	176	9.60	10.09	9.81	8.70	10.97	10.07	9.89	178
NL31	9.46	9.62	9.67	8.97	10.97	10.41	9.87	157	9.52	9.87	9.77	8.93	10.97	10.41	9.94	146	9.64	10.18	9.92	8.94	10.97	10.41	10.04	147
NL32	9.48	9.56	9.82	8.62	10.52	9.98	9.69	189	9.56	9.82	9.90	8.63	10.52	9.98	9.76	185	9.67	10.13	10.04	8.61	10.52	9.98	9.85	187
NL33	9.47	9.63	9.63	8.45	10.48	10.15	9.66	199	9.53	9.89	9.71	8.45	10.48	10.15	9.72	192	9.68	10.21	9.87	8.43	10.48	10.15	9.82	193
NL34	9.49	9.75	9.67	8.41	10.87	8.61	9.47	218	9.55	10.00	9.69	8.41	10.87	8.61	9.53	224	9.72	10.32	9.88	8.41	10.87	8.61	9.64	220
NL41	9.48	9.72	9.70	9.00	10.83	10.43	9.89	152	9.53	9.96	9.78	9.03	10.83	10.43	9.96	140	9.69	10.29	9.94	9.06	10.83	10.43	10.07	138
NL42	9.47	9.79	9.65	9.01	10.92	10.34	9.89	149	9.49	10.03	9.59	9.15	10.92	10.34	9.95	144	9.63	10.38	9.86	9.22	10.92	10.34	10.09	130
PL11	9.71	9.88	9.94	9.46	10.04	10.65	9.99	110	9.72	10.16	9.71	8.90	10.04	10.65	9.89	158	9.72	10.43	9.70	9.00	10.04	10.65	9.95	168
PL12	9.73	9.91	10.02	9.58	10.40	10.44	10.06	94	9.72	10.22	9.84	9.09	10.40	10.44	9.99	127	9.73	10.45	9.74	9.18	10.40	10.44	10.02	149
PL21	9.52	9.52	8.51	9.96	9.76	10.60	9.67	195	9.55	9.86	8.46	9.70	9.76	10.60	9.68	202	9.57	10.15	8.51	9.93	9.76	10.60	9.77	199
PL22	9.53	9.69	8.97	10.09	9.61	10.21	9.72	183	9.54	10.01	8.79	9.63	9.61	10.21	9.67	203	9.55	10.31	8.86	9.86	9.61	10.21	9.77	201
PL31	9.69	9.95	10.08	9.58	10.11	10.57	10.04	97	9.70	10.29	10.06	9.14	10.11	10.57	10.01	120	9.76	10.54	9.94	9.28	10.11	10.57	10.07	139
PL32	9.60	9.78	9.18	10.38	9.65	10.51	9.88	153	9.62	10.14	9.19	10.19	9.65	10.51	9.92	153	9.66	10.41	9.17	10.37	9.65	10.51	9.99	160
PL33	9.61	9.79	9.54	9.83	10.17	10.34	9.92	136	9.63	10.11	9.42	9.36	10.17	10.34	9.88	165	9.68	10.38	9.37	9.49	10.17	10.34	9.94	170
PL34	9.59	9.72	9.98	10.02	10.03	10.25	9.98	117	9.58	10.05	9.88	9.87	10.03	10.25	9.99	125	9.60	10.26	9.79	9.94	10.03	10.25	10.02	150
PL41	9.66	9.95	10.08	9.68	10.09	10.32	10.01	103	9.68	10.21	9.86	9.36	10.09	10.32	9.96	139	9.66	10.48	9.87	9.45	10.09	10.32	10.02	152
PL42	9.54	9.69	10.14	10.32	10.13	10.06	10.02	98	9.55	9.95	9.92	10.20	10.13	10.06	10.01	122	9.58	10.21	9.92	10.39	10.13	10.06	10.09	129
PL43	9.58	10.05	10.15	11.00	10.03	10.11	10.19	72	9.57	10.29	9.88	10.65	10.03	10.11	10.13	88	9.60	10.60	9.99	10.72	10.03	10.11	10.22	105
PL51	9.54	9.74	9.59	9.92	10.11	10.56	9.95	126	9.54	10.00	9.30	9.64	10.11	10.56	9.89	157	9.55	10.30	9.39	9.82	10.11	10.56	9.99	159
PL52	9.58	9.86	9.49	9.74	10.01	10.43	9.89	144	9.57	10.14	9.27	9.32	10.01	10.43	9.83	172	9.59	10.44	9.37	9.38	10.01	10.43	9.90	176
PL61	9.68	9.86	9.96	9.59	10.03	10.26	9.94	128	9.65	10.13	9.74	9.25	10.03	10.26	9.88	159	9.62	10.38	9.70	9.35	10.03	10.26	9.93	171
PL62	9.58	9.64	9.77	9.95	10.23	10.47	9.98	114	9.55	9.94	9.56	9.72	10.23	10.47	9.95	141	9.53	10.17	9.48	9.94	10.23	10.47	10.01	154
PL63	9.56	9.48	9.79	10.29	9.84	10.12	9.89	150	9.53	9.77	9.57	10.02	9.84	10.12	9.85	170	9.50	10.01	9.49	10.10	9.84	10.12	9.89	180
PT11	11.25	10.86	11.30	10.44	10.41	10.84	10.90	32	11.90	11.42	11.53	10.87	10.41	10.84	11.21	25	12.39	11.91	11.73	11.08	10.41	10.84	11.43	27
PT15	13.00	11.69	12.12	11.13	9.78	11.26	11.51	3	13.83	12.22	12.15	11.15	9.78	11.26	11.72	3	14.55	12.68	12.20	11.17	9.78	11.26	11.91	4
PT16	12.02	11.27	11.58	11.16	10.29	11.16	11.29	11	12.66	11.81	11.72	11.31	10.29	11.16	11.53	10	13.16	12.28	11.87	11.47	10.29	11.16	11.73	11
PT17	13.00	11.58	11.94	9.82	10.36	12.36	11.51	2	13.83	12.03	11.95	9.92	10.36	12.36	11.73	2	14.51	12.43	12.07	10.03	10.36	12.36	11.93	3
PT18	13.00	11.91	11.97	10.20	9.33	13.08	11.55	1	13.83	12.42	12.02	10.21	9.33	13.08	11.76	1	14.55	12.86	12.11	10.23	9.33	13.08	11.95	1
RO11	10.03	10.09	9.60	10.38	8.02	10.20	9.73	179	10.10	10.54	9.72	10.18	8.02	10.20	9.80	174	10.20	10.91	9.77	10.15	8.02	10.20	9.88	184
RO12	10.24	9.65	9.85	10.80	7.70	9.92	9.69	191	10.30	10.15	9.99	10.70	7.70	9.92	9.78	179	10.41	10.57	10.09	10.68	7.70	9.92	9.88	183
RO21	10.45	10.20	9.90	10.13	8.35	10.43	9.93	134	10.58	10.71	10.13	9.94	8.35	10.43	10.03	113	10.69	11.08	10.15	9.93	8.35	10.43	10.11	126
RO22	10.93	11.21	10.47	9.24	8.18	9.49	9.91	142	11.22	11.75	10.72	9.07	8.18	9.49	10.04	112	11.41	12.18	10.82	9.07	8.18	9.49	10.14	121
RO31	10.55	11.16	10.12	9.46	8.05	10.73	10.00	107	10.76	11.72	10.33	9.16	8.05	10.73	10.10	100	11.04	12.20	10.52	9.15	8.05	10.73	10.24	98
RO32	10.73	11.54	10.17	9.02	10.18	11.55	10.55	45	10.85	12.09	10.40	8.35	10.18	11.55	10.55	55	11.25	12.57	10.55	8.35	10.18	11.55	10.71	55
RO41	10.37	11.29	9.99	10.11	8.23	10.86	10.14	81	10.69	11.87	10.16	9.84	8.23	10.86	10.26	73	10.94	12.39	10.44	9.82	8.23	10.86	10.42	72
RO42	10.07	10.55	9.68	10.52	8.04	10.58	9.91	141	10.17	11.05	9.79	10.39	8.04	10.58	10.00	124	10.37	11.52	10.03	10.38	8.04	10.58	10.14	122
SE11	9.72	9.26	10.24	11.23	9.16	10.08	9.79	170	9.69	9.68	10.10	11.34	9.16	10.08	9.88	164	9.55	10.01	9.95	11.49	9.16	10.08	9.92	172
SE12	9.64	9.37	10.09	11.54	9.43	9.79	9.80	168	9.64	9.72	9.97	11.57	9.43	9.79	9.87	166	9.49	10.01	9.88	11.59	9.43	9.79	9.91	175
SE21	9.54	9.26	10.20	12.15	9.95	9.71	9.89	146	9.57	9.59	10.06	12.23	9.95	9.71	9.97	135	9.46	9.88	9.99	12.27	9.95	9.71	10.01	153
SE22	9.54	9.41	10.29	10.69	10.30	10.18	9.98	116	9.52	9.72	10.12	10.68	10.30	10.18	10.02	114	9.45	10.00	10.07	10.69	10.30	10.18	10.08	135
SE23	9.54	9.23	9.74	11.25	9.92	9.98	9.78	172	9.58	9.56	9.57	11.33	9.92	9.98	9.85	168	9.47	9.88	9.55	11.39	9.92	9.98	9.92	174
SE31	9.63	8.86	9.64	12.32	7.43	9.48	9.22	238	9.65	9.22	9.42	12.37	7.43	9.48	9.28	239	9.49	9.55	9.37	12.39	7.43	9.48	9.33	242
SE32	9.62	8.18	9.78	12.08	6.84	9.11	8.86	254	9.58	8.52	9.53	12.15	6.84	9.11	8.91	254	9.44	8.86	9.42	12.16	6.84	9.11	8.95	255
SE33	9.74	7.84	9.87	11.54	6.84	8.62	8.68	257	9.67	8.28	9.66	11.56	6.84	8.62	8.76	257	9.58	8.68	9.58	11.57	6.84	8.62	8.84	258
SI01	9.64	9.99	8.04	11.20	9.12	10.21	9.70	187	9.72	10.38	7.95	10.92	9.12	10.21	9.71	198	9.75	10.85	8.41	10.95	9.12	10.21	9.88	182
SI02	9.72	9.86	7.34	11.95	9.20	10.36	9.68	192	9.78	10.29	7.17	11.88	9.20	10.36	9.71	197	9.82	10.80	7.70	11.91	9.20	10.36	9.92	173
SK01	9.78	10.67	10.09	10.36	8.77	9.80	9.94	129	9.86	10.98	9.98	9.57	8.77	9.80	9.85	169	9.96	11.36	10.12	9.57	8.77	9.80	9.95	169
SK02	9.78	10.40	9.85	9.72	9.33	10.13	9.91	139	9.83	10.74	9.73	9.32	9.33	10.13	9.88	162	9.93	11.10	9.84	9.33	9.33	10.13	9.97	162
SK03	9.65	9.49	8.62	11.34	8.58	10.07	9.63	202	9.72	9.88	8.55	10.98	8.58	10.07	9.64	206	9.75	10.26	8.72	11.02	8.58	10.07	9.74	203
SK04	9.62	9.64	8.83	10.88	8.92	9.97	9.66	197	9.69	10.03	8.80	10.62	8.92	9.97	9.69	201	9.75	10.38	8.86	10.64	8.92	9.97	9.77	200

	Baseline period								Scenario period 2011-40								Scenario period 2041-70							
ID	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	**Rank**	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	**Rank**	FFE_CDDMAX	FFE_T2MEAN	FFE_PRECsu	FFS_WILDL	FFS_ACCESS	FFS_COMBU	FF_Impact	**Rank**
UKC1	9.22	8.60	9.57	8.98	9.53	8.87	9.16	244	9.22	8.86	9.64	8.97	9.53	8.87	9.22	243	9.28	9.19	9.65	8.97	9.53	8.87	9.29	244
UKC2	9.19	8.47	9.53	9.45	6.96	9.26	8.80	255	9.17	8.73	9.57	9.48	6.96	9.26	8.85	256	9.25	9.05	9.61	9.47	6.96	9.26	8.92	256
UKD1	9.24	8.52	8.67	9.73	8.25	9.20	8.96	249	9.21	8.77	8.74	9.75	8.25	9.20	9.01	250	9.30	9.09	8.83	9.76	8.25	9.20	9.10	252
UKD2	9.34	9.16	9.92	8.54	11.07	9.43	9.59	207	9.33	9.41	9.97	8.47	11.07	9.43	9.62	209	9.44	9.73	9.99	8.49	11.07	9.43	9.70	207
UKD3	9.33	9.04	9.57	8.60	10.61	9.46	9.46	223	9.32	9.28	9.58	8.50	10.61	9.46	9.48	230	9.42	9.59	9.62	8.48	10.61	9.46	9.55	230
UKD4	9.29	8.81	8.98	8.91	9.59	9.43	9.20	240	9.25	9.06	9.02	8.91	9.59	9.43	9.25	241	9.38	9.37	9.09	8.98	9.59	9.43	9.35	241
UKD5	9.35	9.23	9.93	8.44	10.95	8.48	9.40	232	9.34	9.48	9.92	8.40	10.95	8.48	9.43	232	9.44	9.79	9.95	8.42	10.95	8.48	9.51	232
UKE1	9.47	9.20	10.28	8.34	10.87	8.80	9.50	217	9.45	9.46	10.32	8.43	10.87	8.80	9.56	218	9.52	9.79	10.32	8.44	10.87	8.80	9.63	222
UKE2	9.32	8.82	9.67	9.14	9.74	9.06	9.33	235	9.32	9.08	9.80	9.33	9.74	9.06	9.43	233	9.39	9.41	9.81	9.34	9.74	9.06	9.50	234
UKE3	9.41	9.16	10.08	8.70	10.47	8.81	9.46	222	9.42	9.41	10.19	8.55	10.47	8.81	9.49	227	9.49	9.74	10.15	8.60	10.47	8.81	9.56	229
UKE4	9.27	8.93	9.58	8.76	10.80	8.72	9.36	234	9.28	9.18	9.75	8.71	10.80	8.72	9.42	235	9.35	9.50	9.74	8.69	10.80	8.72	9.48	235
UKF1	9.42	9.11	9.95	8.67	10.30	8.95	9.42	226	9.45	9.37	10.12	8.63	10.30	8.95	9.49	226	9.55	9.70	10.12	8.68	10.30	8.95	9.57	226
UKF2	9.49	9.27	10.32	8.41	10.74	8.84	9.52	215	9.52	9.55	10.42	8.32	10.74	8.84	9.57	216	9.66	9.90	10.48	8.32	10.74	8.84	9.66	217
UKF3	9.50	9.28	10.36	8.36	10.69	9.21	9.58	208	9.55	9.55	10.41	8.29	10.69	9.21	9.63	208	9.60	9.88	10.43	8.29	10.69	9.21	9.70	209
UKG1	9.43	9.31	10.18	8.56	10.84	8.72	9.52	216	9.52	9.60	10.36	8.65	10.84	8.72	9.62	210	9.63	9.95	10.44	8.68	10.84	8.72	9.72	205
UKG2	9.33	9.09	10.01	8.73	10.75	9.21	9.54	211	9.40	9.36	10.14	8.80	10.75	9.21	9.63	207	9.51	9.70	10.18	8.84	10.75	9.21	9.72	204
UKG3	9.43	9.22	10.16	8.37	11.17	8.82	9.53	214	9.50	9.49	10.32	8.31	11.17	8.82	9.60	212	9.64	9.83	10.38	8.29	11.17	8.82	9.69	214
UKH1	9.51	9.37	10.52	8.49	10.75	7.75	9.38	233	9.58	9.64	10.58	8.37	10.75	7.75	9.42	234	9.69	9.97	10.65	8.37	10.75	7.75	9.50	233
UKH2	9.57	9.41	10.44	8.52	11.09	6.32	9.12	245	9.66	9.70	10.54	8.39	11.09	6.32	9.17	245	9.79	10.05	10.65	8.35	11.09	6.32	9.26	245
UKH3	9.58	9.46	10.50	8.44	11.10	6.18	9.09	246	9.65	9.76	10.59	8.35	11.10	6.18	9.15	246	9.79	10.12	10.70	8.32	11.10	6.18	9.24	247
UKI1	9.62	9.58	10.40	8.32	11.32	5.96	9.06	247	9.69	9.87	10.52	8.27	11.32	5.96	9.12	247	9.86	10.21	10.65	8.27	11.32	5.96	9.22	248
UKI2	9.62	9.56	10.45	8.49	11.23	6.32	9.17	243	9.68	9.85	10.52	8.33	11.23	6.32	9.21	244	9.85	10.19	10.67	8.31	11.23	6.32	9.30	243
UKJ1	9.57	9.41	10.38	8.68	11.11	7.77	9.47	221	9.62	9.71	10.49	8.63	11.11	7.77	9.53	222	9.78	10.07	10.64	8.61	11.11	7.77	9.64	221
UKJ2	9.62	9.45	10.44	9.40	10.98	7.59	9.56	210	9.72	9.75	10.51	9.08	10.98	7.59	9.58	213	9.89	10.10	10.73	9.01	10.98	7.59	9.69	213
UKJ3	9.67	9.41	10.48	9.13	10.88	7.75	9.54	213	9.73	9.72	10.57	8.93	10.88	7.75	9.58	215	9.90	10.10	10.78	8.92	10.88	7.75	9.70	208
UKJ4	9.57	9.46	10.46	8.82	11.07	7.32	9.41	231	9.66	9.75	10.52	8.73	11.07	7.32	9.47	231	9.82	10.09	10.71	8.71	11.07	7.32	9.57	227
UKK1	9.52	9.37	10.27	8.72	10.29	8.30	9.42	227	9.65	9.67	10.45	8.87	10.29	8.30	9.55	219	9.77	10.05	10.61	8.90	10.29	8.30	9.66	216
UKK2	9.57	9.30	10.26	8.68	10.58	9.13	9.61	205	9.70	9.62	10.46	8.75	10.58	9.13	9.73	190	9.81	10.00	10.63	8.75	10.58	9.13	9.84	190
UKK3	9.56	9.16	9.99	8.84	10.60	9.61	9.65	200	9.60	9.51	10.17	8.92	10.60	9.61	9.76	184	9.76	9.88	10.30	8.96	10.60	9.61	9.88	181
UKK4	9.54	9.13	10.05	9.02	9.90	9.55	9.57	209	9.65	9.45	10.30	9.22	9.90	9.55	9.72	196	9.75	9.81	10.45	9.26	9.90	9.55	9.83	192
UKL1	9.32	8.74	9.46	9.91	9.85	9.26	9.45	224	9.35	9.01	9.63	9.92	9.85	9.26	9.54	220	9.50	9.35	9.73	9.93	9.85	9.26	9.64	219
UKL2	9.27	8.83	9.30	10.22	9.55	9.17	9.42	229	9.32	9.11	9.56	10.25	9.55	9.17	9.53	223	9.43	9.47	9.65	10.26	9.55	9.17	9.63	223
UKM2	9.20	8.31	9.31	9.54	6.84	8.52	8.61	259	9.17	8.58	9.37	9.70	6.84	8.52	8.68	259	9.24	8.92	9.42	9.71	6.84	8.52	8.76	260
UKM3	9.19	8.44	8.83	10.18	8.06	8.98	8.96	248	9.17	8.70	8.90	10.20	8.06	8.98	9.02	248	9.25	9.03	8.99	10.20	8.06	8.98	9.10	251
UKM5	9.21	8.17	9.93	9.13	6.84	8.87	8.67	258	9.20	8.45	9.88	9.25	6.84	8.87	8.73	258	9.22	8.78	9.91	9.25	6.84	8.87	8.79	259
UKM6	9.05	8.04	8.47	9.53	6.84	7.50	8.22	261	9.01	8.29	8.50	9.54	6.84	7.50	8.26	261	9.08	8.58	8.58	9.54	6.84	7.50	8.33	261
UKN0	9.12	8.68	9.12	9.00	9.68	9.41	9.20	241	9.11	8.93	9.19	9.03	9.68	9.41	9.26	240	9.20	9.26	9.30	9.04	9.68	9.41	9.36	240